



Charles E. Kellogg

MEDITERRANEAN JOURNAL

May (and July) 1947

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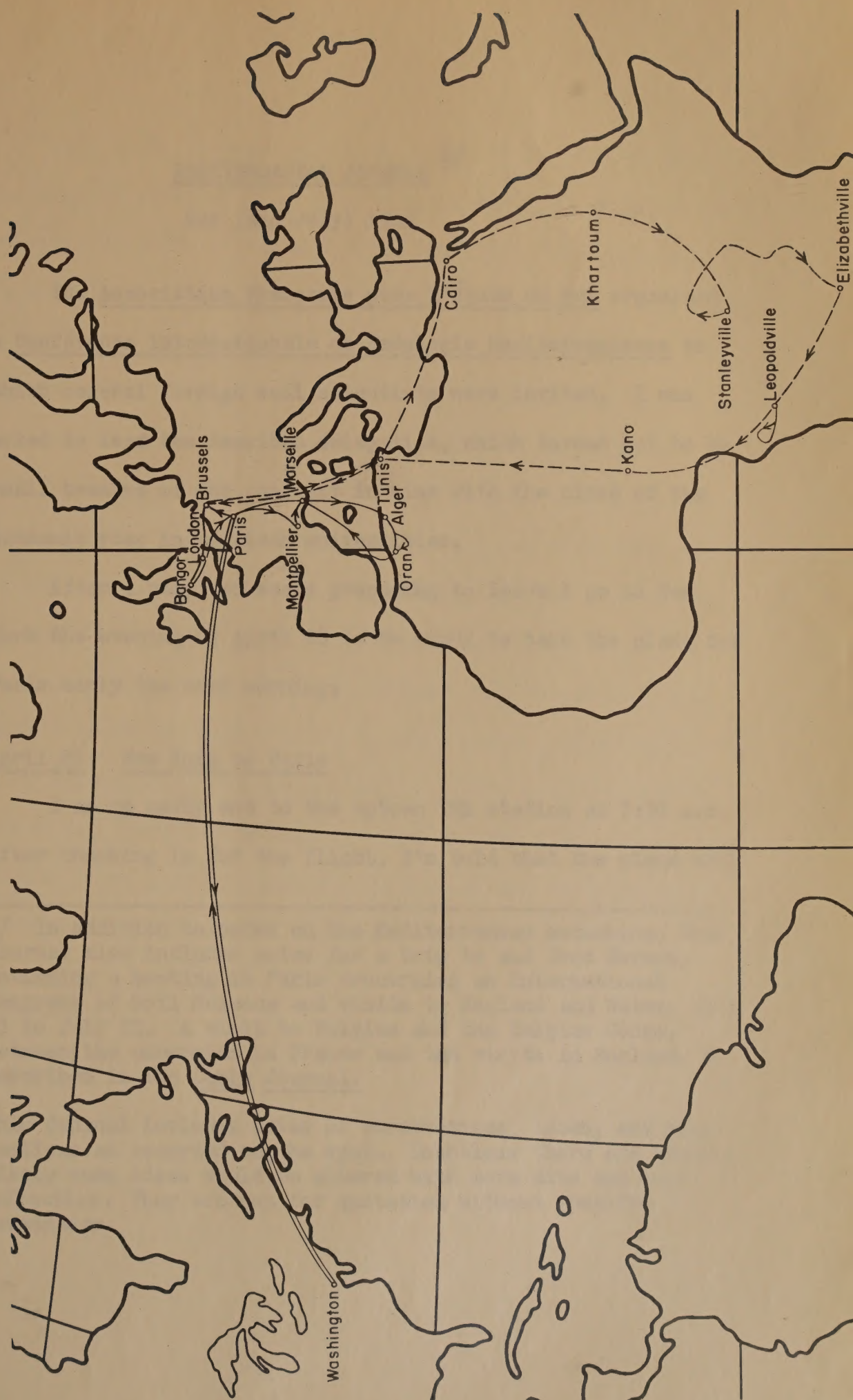
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Schematic Route of Travels Overseas

1947

Described in
Mediterranean Journal —
and
Congo Journal — — —



MEDITERRANEAN JOURNAL ^{1/}

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The Association Française pour l'Étude du Sol organized a Conférence Internationale de Pedologie Mediterraneenne to which several foreign soil scientists were invited. I was asked to lead the American delegation, which turned out to be small because of the conflict in time with the close of the academic year in American universities.

After a busy two weeks preparing to leave I go to New York the evening of April 28 to be ready to take the plane for Paris early the next morning.

April 29: New York to Paris

I am up early and to the uptown TWA station at 7:30 a.m. After checking in for the flight, I'm told that the plane will

1/ In addition to notes on the Mediterranean excursion, this Journal also includes notes for a trip to and from Europe, including a meeting in Paris concerning an International Congress of Soil Science and visits to England and Wales, July 13 to July 22. A visit to Belgium and the Belgian Congo, between the excursion in France and the visits in England, is described in the Congo Journal.

This Journal includes notes of observations, ideas, and suggestions as recorded on the spot. Doubtless there are errors. Likely some ideas would be altered with more data and more reflection. They are not for quotation without specific permission.

be 2 hours late in starting. Here I meet Dr. R. L. Pendleton who is going with me to the Conference. At 10:30 we go to the LaGuardia Airport. We have more delays here, but board the plane at 12:30 p.m. After a demonstration of life-saving vests we are in the air at 12:57. We go to very high strata at once and visibility is poor. As we fly over Nova Scotia there is some snow on the ground and the land looks cold. The ponds in Newfoundland are still frozen and many of them are covered with snow. We have a good west wind and are making about 325 miles per hour. We are down at Gander, Newfoundland at 5:05 eastern standard time or 6:35 local time. We leave Gander about 7:40 p.m. just at sundown. There are streaks of red and dark gray clouds. The land looks cold, wet, and dreary. From the air the muskeg swamps look like brown fields. There is still lots of snow in the forest. The bays are open but the inland ponds are frozen. About 8:15 it is dark. At 9:35 I have finished dinner and settle down the best I can for a long night.

April 30: Paris

At 1:00 a.m. by my watch (E.S.T.) the dawn is just beginning. The sky is a beautiful dark red. It is clear around the plane, and just above the sea are a lot of open fleecy clouds. I am told we shall be due in Shannon on schedule. Because of the strong west wind we have made up most of the 3 hours delay out of New York. At 6:15 Greenwich time we have come over land. Essentially all of it is cultivated in irregular geometric patterns to the very edge of the rocky shore. The soil is dark brown and light brown. There are many fields of small grain and pasture, with hedges between the fields. The shore line is very irregular and the small islands off shore are cultivated. All the land I can see is smooth. There is almost no woods. The farmsteads look very nice. Most of them have 2 to 4 buildings besides the house. There are only a few thatched cottages. There are high hedges on nearly all the roads. Some of the pastures appear to be bushy. The soil is likely Brown Forest or a mixture of Brown Forest and Gray-Brown Podzolic.

We pass over a muddy arm of the sea to the airport just beyond. We are down at Shannon at 6:35 Greenwich time or 7:35 London time, which in the summer is the same as Paris time.

At 8:32 we are in the air leaving Shannon. In the east the farming is somewhat more intense; the soil is dark brown. There are a few ponds here and there. Near the east coast of Ireland there is more relief. As we pass over the Irish Sea there is a dense cloud cover. This breaks just a bit to give a few glimpses of farm land in southwest England. Then we get a glimpse of land used intensively on one of the Channel Islands.

The clouds break a bit over Normandy where I see small fields with hedges between them laid out in irregular geometric patterns. About 30 minutes out of Paris we pass over Brown Forest soil which seems to change very quickly in the east to Gray-Brown Podzolic. There are a few scattered farms and many small villages. The land looks beautiful from the air. Although there is not much forest there are many specimen trees in orchards, fields, and hedges. There is much more fallow land either plowed or just seeded than near the coast. Twenty minutes out of Paris there is quite a bit more forest, and then we come into an area that is about half fallow with very few trees of any sort.

After passing over an area that is partly forest and partly cleared, with widely-spaced villages, I get a glimpse of the Eifel Tower, so this must be "it." Near the airport are some beautiful villages with large gardens and the red tile roofs -- "la Belle France." We are down at Orly field at 10:53. We are

(Mop1)

EAST FROM GREENWICH



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held in the plane for quite awhile, then in the vestibule, and again at the desk. There is a great deal of confusion. I'm sure that if one-half of the personnel at this airport were sent home the rest could then operate with some efficiency. As it is, they simply get in one another's way. About an hour of senseless waiting wears my patience quite thin. Finally the customs man looks at my bags -- quite superficially -- after I explain what a bootjack is and why I have one! I send a cable home and go out and wait in the bus for the others.

Pendleton and I drive into the city from the airport in the bus and then take a taxi to the United States Embassy. We arrive there about 1:30 and go to lunch with Mr. Thibodeaux, the Agricultural Attaché, and his assistant. I repack my bags after lunch and leave some of the maps and other supplies that I have brought for a later trip to the Congo with Mr. Thibodeaux.

After some discussion with Mr. Thibodeaux and his people about arrangements for the Conference and for our return after the Conference, I have time for a short walk near the Embassy before train time. At 5:30 Pendleton and I take a cab to the Gare de Lyon and buy our tickets for the train to Montpellier. Although I had written to the French asking them to make a reservation on this train, I find just now there are no sleeping cars! This means 2 nights without any sleep, and a speech tomorrow!

TEMPORARY PASS

AMERICAN EMBASSY MESS

4, Avenue Gabriel, Paris.

Dr. Charles E. Kellogg

Issued on: April 30, 1947

Valid until: May 31, 1947

Sam J. Day
Mess Officer

TALON DEVANT ETRE REMIS A LA MAIRIE
2^e Semestre 1947.

TITRE N° 3.662

NOM

Date de la délinance

**N° du Pas-
seport ou
de la Carte
d'identité**

**A remplir par la Mairie
détenant les Titres.**

Le titulaire du présent Titre entrant en France, en vue d'un :

Séjour temporaire) Rayer la mention inutile
Séjour définitif)

Perceva en échange de ce coupon à la Mairie de son premier lieu de destination ou de résidence les Titres d'alimentation auxquels il a droit sur présentation des pièces énumérées ci-contre.

INSTRUCTION

Les tickets ci-joints, groupés en trois bandes verticales représentant chacune les rations d'une journée, doivent permettre au titulaire d'assurer son alimentation depuis son passage à la frontière ou son arrivée au port ou à l'aérodrome, jusqu'à son lieu de première destination.

Il devra alors se présenter à la Mairie, où en échange du talon ci-contre (coté gauche de la feuille) et sur présentation suivant le cas, soit d'un passeport ou titre de voyage en tenant lieu, soit d'un certificat modèle 5 ter ou de radiation, il lui sera remis les Titres d'alimentation auxquels il a droit.

NOTICE

Three vertical rows of coupons are attached to the present emergency ration card, each row entitling its holder to one day's full rations, in order to allow him (or her) to reach his (or her) destination after entering France by a port or airfield.

The present card must then be surrendered to the municipal food office (at the Mairie), where either on presentation of the holder's passport (or a document replacing it), he (or she) will be given the rationing documents to which the holder is entitled.



TICKETS POUR ISOLÉS CIVILS

Titre 3.662

1^{er} Semestre

1947



On the train I meet Henin, and some of my other French friends. Then I find there is no restaurant car on the train! So I hurry out to get some bread, etc., for an evening lunch. At 7:20 p.m. we are off. The road bed is smooth but the train is very noisy and cold. There is no heat at all. There is little opportunity for sleep.

May 1: Montpellier

Daylight breaks about 5 o'clock in Montelimar in the Rhone valley. I notice that all the trees along here lean to the south of southeast. The farms are small and have a good deal of fruit. Most farmers use windbreaks for vines and vegetables. There is quite a bit of unrepaired war damage to be seen. About 6:28 we pass through Avignon. Here there is some bad war damage. Many of the garden walls are covered with roses and there are beautiful trees and shrubs. Vegetables are grown, including cabbage, cauliflower, asparagus, and late tomatoes. There are peaches, apricots, and some cherries. But, of course, there are many vineyards. Olives are on the drier sites, especially on the high terraces. Some of the low terraces are irrigated.

There are practically no cattle in this country. The steep slopes are nearly barren and some of these have lost soil by erosion. Some farmers are growing vegetable seeds. At 7 o'clock we pass Tarascon, which has some picturesque castles. Along the railroad I see quite a bit of war damage.





Henin comes early into our compartment and talks interestingly about conditions in France and some of the plans for the Conference.

Along the railroad are some high gravelly terraces. The lower terraces in the valley have many small intensive farms, but the older ones are now badly eroded and are not used. They are mostly covered with shrubs. All along the right-of-way are great numbers of small red poppies.

Then we come out onto a broad well drained terrace, partly in grain but mostly in grapes. The soil is reddish-brown, nearly orange in color.

We arrive in Montpellier at 8:30 a.m., with no breakfast except for a terrible cup of coffee at Avignon. I go to breakfast at once and find that it is only "café complete!"

Then I go to my hotel room and shave and clean up. At first I have some difficulty in finding the meeting place because of being twice misdirected from the hotel. But I get there through devious ways in narrow streets just before the introductions are over. Demolon looks 10 years older than when I saw him two years ago in Moscow.

Ogg of Rothamsted, replies to the welcome on behalf of the guests. His reply is animated by continually pushing his glasses to his forehead and then letting them fall onto his nose each time he looks at his notes. I cannot help being amused at

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CONGRES DE PEDOLOGIE A MONTPELLIER

N° d'Inscription

21

M. *Maurice Kellog*

ITINERAIRE

- 1 Mai - Arrivée à Montpellier -
Transfert à pied à l'hôtel *Metropole*
Chambre réservée : 1 lit *san*
: ~~1 lit dans une chambre à 2 lits~~
Petit déjeuner, déjeuner, dîner à l'hôtel Metropole
- 2 Mai - A Montpellier -
Petit déjeuner, déjeuner, dîner à l'hôtel Métropole
Dans l'après-midi excursion en autocar
aux environs immédiats de Montpellier
- 3 Mai - A Montpellier -
Petit déjeuner, dîner à l'hôtel Métropole
Excursion par autocar à Saint-Guilhem le Désert
Déjeuner à Saint-Guilhem à l'hôtel Moderne
- 4 Mai - A Montpellier -
Petit déjeuner, dîner à l'hôtel Métropole
Excursion par autocar à l'Aigoual
Aller par Vallerargue
Retour par le Col du Minier
Déjeuner à l'Espérou au Grand Hôtel du Parc
- 5 Mai - A Montpellier
Petit déjeuner, déjeuner, dîner à l'hôtel Métropole
- 6 Mai - A Montpellier
Petit déjeuner à l'hôtel Métropole
Départ à 7h.30 par autocar pour Nîmes
Arrivée à Nîmes vers midi
Transfert à l'hôtel *Imperator*
Chambre réservée : 1 lit
: ~~1 lit dans une chambre à 2 lits~~
Déjeuner, dîner à l'hôtel *Imperator*
Dans l'après-midi départ en autocar
pour la traversée de la Garrigue Nimoise,
le Pont du Gard, Ledenon et retour à
Nîmes dans la soirée.
Transfert à l'hôtel
- 7 Mai - A Nîmes
Petit déjeuner à l'hôtel *Imperator*
Départ de Nîmes dans la matinée
en autocar pour Arles
Arrivée à Arles vers midi et conduite pour le
Déjeuner à l'Hôtel Jules César
Continuation après le, déjeuner sur Marseille
Marseille arrivée dans la soirée
Transfert à l'hôtel *Splendid*
Chambre réservée 1 lit
: ~~1 lit dans une chambre à 2 lits~~
Dîner à l'hôtel *Splendid*
- 8 Mai - A Marseille
Petit déjeuner à l'hôtel *Splendid*
Transfert au quai par autocar à 8 heures
Marseille quai départ vers 10h. pour Alger

Couchettes réservées à bord sur le "Ville d'Oran" à l'aller de Marseille
à Alger classe - couchette n°

Ogg's remarks in reference to "colonial" soils as if they were some kind of genetic group comparable with Podzol or Chernozem!

After the introductions are finished, we have an excellent lunch. Besides the foreign guests there are a good many French young men located at the university or nearby.

After lunch I go back to the university for the afternoon session. The buildings are old. The university itself was established in the 12th century. Then I give my paper. It is a difficult job after missing two nights of sleep. There is a long discussion afterward. I am so tired.

After this I listen to a long paper discussing a soil pH map of France. Since this and the discussion are in rapid French I don't understand all, but I doubt if I miss a great deal.

Later I return to the hotel in order to change and rest a bit before dinner at 7:30. I have a room in the PIM Hotel about a block away from the Metropole where we have our meals. My room is comfortable except that a part of the bathroom fixtures are out of order.

Dinner at the Metropole is fairly good, although the main course is eggs. Schofield from Rothamsted played a few tunes on his fife. After dinner I go to bed at once.

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Haute-Mode

Couture

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Clos-René

de la Métropole

PHONE : 75-23



LÉGENDE

1. Palais Universitaire.
2. Cathédrale.
3. Palais de Justice.
4. Préfecture.
5. R.T.T.
6. Arc de Triomphe.
7. St. Anne.
8. Théâtre.
9. St. Denis.
10. Gare.

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April 15, 1947

THE DETAILED SOIL SURVEY IN THE UNITED STATES 1/

by

Charles E. Kellogg 2/

Detailed soil surveying was begun in the United States 49 years ago. Since that time our very concepts of soil and the techniques of investigation, classification, mapping, and interpretation have changed completely. Indeed, nearly the whole body of knowledge that we have come to know as modern soil science was developed during this period. Yet the practical objectives of the Soil Survey in the United States have remained nearly the same, during its history; but now the soil classification and soil maps are much more precise than formerly and have much greater prediction value.

Purposes

Studies of soils in the field, supplemented with laboratory examinations, are made throughout the United States and Territories with three primary objectives in view: (1) Soil types are defined in terms of all significant internal and surface characteristics, and grouped into a uniform system of classification with uniform nomenclature; (2) the distribution of the soil types is shown on maps of such detail and accuracy that the production potential of each field and farm may be predicted; and (3) each soil type is defined according to adaptability to crops, pastures, and trees, management requirements for sustained production, and expected yields of individual crops under defined systems of use and management.

The results are designed to provide an accurate basis for:

- (1) Prompt application of tried methods and new discoveries in soil and crop management by farmers and other land users, and by agricultural advisors and technicians;
- (2) Planning agricultural research and extending the results to the kinds of farms and soils where they apply;
- (3) Rural land classification, rural zoning, and public land management;
- (4) Land appraisal for tax assessments, farm loans, and farm purchase;
- (5) Assisting prospective farmers, new settlers, and colonizing groups in the proper selection of land;
- (6) Planning engineering works like highways and airports, as well as those for flood control, drainage, irrigation, and conservation (erosion and run-off control);
- (7) Determining the potential distribution and adaptability of individual crops, crop rotations, and soil management practices; and
- (8) Correlation of soil conditions in the United States with those of other countries so that applicable experience in other lands may be available to American farmers and agricultural scientists.

For Conference de pedologie Mediterraneene, May, 1947.
Chief, Division of Soil Survey, United States Department of Agriculture -----

Development of classification

When the Soil Survey began in the United States about 50 years ago, there was no clearly recognized body of knowledge that we have come to know as soil science. Early workers had been trained in other fields; they had a more or less unrelated bundle of principles from chemistry, physics, botany, and geology, which they began to apply to soil problems. Their interest was stimulated by the practical problems they saw around them on farms and the conviction that modern science could contribute greatly to their solution.

In the beginning, soils in the field were conceived of as weathering products of recognized geological formations, defined by land form and lithological composition. The early workers in the Soil Survey were geologists because geology was the only science with methods and techniques appropriate to field study, and geologists were trained in the scientific methods of correlation.

As the work progressed, it became obvious that many important soil characteristics were not definitely related to land form or rock type. Obviously, poorly drained soils have different characteristics than well-drained soils. And steep soils are unlike level ones. But also on similar glacial till from Maine to Montana, and down to the Ohio River, are entirely unlike soils in the several climatic and ecological zones.

But for a long time the geological view predominated in the field and the old balance sheet theory of plant nutrition, inherited from Liebig and his followers, in the laboratory. Although taught in the classrooms until the early twenties, neither theory actually worked in the field as a basis for reliable predictions to farmers. As a consequence, all sorts of little theories were developed -- theories which broke down in contradiction. A new concept was needed.

Meanwhile the work of the Russian school of soil science became available, and by the end of the first World War the concept of soils as independent natural bodies was accepted by the leaders in the Soil Survey.^{1/} The study of the soil itself received great emphasis, and by 1925 a large amount of morphological and chemical work was being done on soil profiles throughout the country. As first developed, however, the new concept of genetic soil profiles dealt with soils as points. This weakness became evident in the United States because of the great emphasis upon detailed soil maps for their practical prediction value. In making a detailed soil survey every part of the land must be described, classified, and named -- the unusual and transitional as well as the "typical" soils.

Around 1930 the concept of soil was broadened from the earlier and simpler profile concept to the more useful one of soil as a three-dimensional landscape, with a surface area bounded by lines at which there is a change in their characteristics resulting from changes in one or more of the five genetic factors, and with a depth extending down as far as the living organisms. These landscapes are identified by a defined range in soil profiles -- profiles that reflect the

^{1/} Although the concepts introduced by the Russian school had a profound influence in the United States, they were by no means accepted in all detail.

synthetic influence of all factors of the environment. Under this concept, fundamental soil research was again accelerated and the possibilities of practical application enormously increased.

Thus from a very small beginning, scientists first learned how to study soils. They learned what characteristics are relevant and how individual soil characteristics and soils as landscapes are related to the genetic factors of the environment.

Detail and accuracy of mapping

The early units of classification were loosely defined. As we understand soils today these units included a wide range of significant characteristics -- characteristics that we have since learned to interpret in terms of land use and management. Thus the early mapping units were broad and few attempts were made to establish the precise boundaries between soil types with great accuracy. In fact, it would have been impossible in the early years of the work until the soil types themselves had been defined precisely.

Further, as agriculture has become more and more scientific and less and less traditional, the demand for accurate maps has increased. As agricultural research goes forward, we understand better the significance of differences in soils, and we can make more precise differential recommendations to farmers. Since many of the new practices require expensive machinery, chemicals, and so on, it is becoming increasingly important that recommendations be given in accordance with local differences in soil if waste is to be avoided and the highest possible efficiency achieved.

Thus as the potentialities of soil science increased, the demand for accuracy in classification and mapping increased. Taken together, these factors have resulted in greatly increased accuracy and detail in soil surveying in the United States. Whereas the early surveys were made in the field rapidly on a scale of about 1:63,360 and published on the same scale, modern detailed soil surveys are now being made in the field on high quality aerial photographs at scales of about 1:20,000 or 1:10,000 and published on scales varying from about 1:43,000 to 1:24,000, depending upon the complexity of the soil pattern. For difficult problems in planning irrigation projects and similar undertakings some soil surveying is being done in the United States on scales even larger than 1:10,000.

The change from the ground methods of soil mapping to the use of aerial photographs developed gradually during the twenties. The cost of compiling maps made on aerial photographs is, of course, greater than the cost of compiling maps made by ground methods. To do a satisfactory job highly trained photogrammetric engineers must be employed in order to adjust the work to a satisfactory base. But the final maps are ever so much more accurate, if properly assembled, because the soil scientist in the field can locate his soil boundaries precisely in relation to the local features in the landscape, and because the base maps can be very carefully controlled. It was found through hard experience that there is no "easy" way to compile a proper map from aerial photographs. Unless qualified photogrammetric engineers can be had to supervise the compilation work, the product is bound to be unsatisfactory.

Because of the much greater detail and accuracy with which soil boundaries may be plotted in the field, essentially all soil surveying in the United States has been done on aerial photographs during recent years.

Progress in interpretation

During the two decades or more of its history, soil scientists in the Soil Survey took the position that it was their function to get the facts about soils, classify them, and map them in ways that would furnish a sound basis for interpretation by other people. Dominated by this attitude, soil scientists carrying on the field investigations and mapping described the soils as shown on the maps and included a series of statements about their use, based partly upon the results of research, but mostly upon observations made during the course of the survey itself. Individual scientists varied a great deal in their ability to capture the essential facts, but commonly the soil survey reports that accompanied the soil maps were qualitative and general.

It was not until the Soil Survey was in its third decade that soil scientists themselves were required to develop definite schemes of land classification and interpretation, to any great extent. Then they realized more fully how qualitative their descriptions had been. Other workers, not having the background of experience and knowledge possessed by soil scientists, had usually failed in their attempts to interpret the work of the soil survey. Thus during the past 20 years scientists in the Soil Survey have seen the necessity of assuming more and more responsibility for the interpretation of the soil survey and related soil research. As the other phases of agricultural science become even more specialized this obligation of soil scientists will increase rather than diminish. Most plant scientists, for example, are concerned with individual crops like wheat, rubber, sugarcane, cotton, tobacco, apples, and what not. Soil scientists must be concerned with all of the adapted crops in relation to each individual soil type. As an inevitable result, a large portion of the time of scientists engaged in soil surveying is necessarily devoted to the analysis of experimental data and of farm experience, as related to individual soil types defined in the classification and shown on soil maps.

The greatest step forward, on the practical side, in the interpretation of soil maps in the United States, has been the development of definite productivity ratings. These ratings express the predicted yields of adapted crops under alternative, physically defined systems of soil and crop management for each soil type. Their development depended upon the concept of soil as landscape.

Through this device all of the available information about a soil is synthesized into a few definite, easily comprehended figures.

The publication of these estimates and ratings of expected yields met with great approval on the part of soil survey users. But the attempt to develop them disclosed immediately the enormous gaps in our information. Only part of the data from experimental plots could be used because many of them were not located on fair examples of significant soil types. Most yield records in farm account books were not even related to specific fields, let alone to specific soil types.

But gratifying progress has been made in the last 15 years. Experimenters generally appreciate the great importance of locating experimental plots and fields on fair examples of soil types worth sampling. Many of the State agricultural experiment stations now have established research projects for determining precisely the response of defined soil types to specific management practices.

In the years immediately ahead increased emphasis will be given necessarily to the correlation of research dealing with the units of soil classification and their interpretation in terms of specific management responses. More attention will be given to laboratory studies of soil samples collected in advance of a soil mapping project. Combined morphological, laboratory, and root studies of the important soils and plants must be undertaken.

But the greater need is not so much for entirely new research as it is for improved organization, synthesis, and interpretation of researches already under way or authorized, in order that the results may be specifically related to the individual units of soil classification.

Interaction of classification, mapping, and interpretation

Definite interpretations of soil units have required that the lower taxonomic units in the system of classification be precisely and narrowly defined. Over the years, this has resulted in a large increase in the number of individual soil types and phases in the classification and on the soil maps.

Taxonomic units.--In the American system of soil classification and nomenclature the soil series is the lowest category defined on the basis of all relevant soil characteristics. That is, all soils having the same kind of profiles are included within a soil series, although within a series there may be soils having agriculturally significant variations in surface texture, stoniness, or slope, that are shown as subdivisions of the series. Series are given proper names -- geographical place names -- in the same way as geological formations are. Proper names like Miami, Barnes, Hagerstown, Mohave, and Cecil connote whole sets of profile and surface characteristics that distinguish a soil as being of a certain kind. As the soil classification work has progressed, and as more and more precise information has become available, the range in characteristics permitted within any soil series has become narrower. In other words, soils now grouped into four or five separate soil series were, several years ago, included within one soil series.

Within soil series there are, however, two lower categories of classification--soil type and soil phase. These are differentiated from one another within a soil series on the basis of a limited number of characteristics within the range permitted for the soil series. Types within a series are established on the basis of the texture (soil class) of the A horizon, or of the normal depth of plowed soil where the A horizon is less than that.

When the Soil Survey began it was conceived that the soils within a soil series might have a wide range of texture. At that early time soil series were conceived of mainly in geological terms. Ideally weathering granite, for example, could be laid out in a series of alluvial deposits varying in texture from gravel to fine clay. This geological concept is no longer held as valid, and most soil series include soils of only a narrow range in texture. Many soil series contain only one type or two types, like loam and silt loam, or clay loam and silty clay loam.

In the American nomenclature the soil type gets its name from the series name plus the classname of the surface texture, like Miami silt loam and Barnes loam. Of course, two soil types in different series vary from one another in a great many characteristics besides surface texture.

The soil phase has been recognized increasingly in the American system as soil mapping has become more detailed. It is used to distinguish soils that are essentially alike in profile characteristics and in their dynamics in the natural landscape under the native vegetation, but which have differences of importance to their functioning when placed under use. Differences in slope or stoniness, for example, which are not associated with consistent differences in the soil profile or in soil dynamics in the natural landscape, may be very important to the use of agricultural machinery, rate of run-off and erosion when cultivated, and similar pragmatic considerations. Thus included in Miami silt loam are undulating and rolling phases, stone and stone-free phases, and uneroded and eroded phases.

In former years the term "phase" in the American system was also used to indicate departures from the normal or typical soil type. Thus on the older maps there were shown "hardpan phases" of soils not normally having hardpans. In recent years the classification is being revised to eliminate such anomalies.

Data from plot experiments and observations on land-use experience must be synthesized on the basis of the phases of soil types within the series. Laboratory data are obtained on the genetic horizons of the individual soil types. Some recommendations for crop adaptability and soil management practices may be given by soil series. Most of them are given in terms of soil types. A good many, especially those having to do with tillage and run-off control, must be given by phases within types. Yield estimates and productivity ratings, since they comprehend all relevant data regarding use and management, must be given by soil phases. That is, one gives a farmer a somewhat different recommendation for Memphis silt loam, undulating phase, than for Memphis silt loam, rolling phase.

Mapping units.--Regardless of the mapping scale, one always finds complicated landscapes where the individual taxonomic units cannot be shown separately. The greater the detail of mapping, of course, the more nearly one can come to showing each taxonomic unit separately on the map. But in very complex landscapes the scale of mapping needs to be unreasonably great in order to indicate each soil type and phase separately. In small-scale mapping it is rarely possible to show the individual taxonomic units, however contrasting, separately on the map.

Thus in the American system unlike soils, intimately intermingled geographically, are necessarily placed together into a single mapping unit. These geographic groups of unlike soils are called soil associations. Each soil association is defined on the basis of the percentage and pattern of the named taxonomic units within it. For generalized or schematic maps the soil association is the mapping unit. On detailed soil maps the individual taxonomic units are shown separately where possible with a practical scale of mapping. Where this is not practical, the soil association is mapped as a unit and called in the mapping legend of detailed surveys a soil complex. A common complex, but by no means the only one, is the catena. A catena, in the American system, is a special kind of a soil association -- one in which there are two or more soil types with contrasting characteristics due to differences in relief, although developed from the same geological materials. Often the individual soil types of a catena can be mapped separately in detailed mapping, and occasionally they cannot.

Complexes and associations are usually given names to indicate the dominant end members of the taxonomic units which compose them. Thus one might have a Fargo-Beardon association that includes all the types and phases within the allowable limits of those two series. Or one might have Miami silt loam, undulating and rolling phases ^{1/} as a complex of two phases within the allowable variation of the Miami silt loam type.

In early soil surveying complex areas were shown on the maps in accordance with the dominant taxonomic unit, usually the soil type. This resulted in confusion where areas actually contained several taxonomic units. Thus as the classification has been refined it has been necessary to recognize soil associations of taxonomic units in order to show the real conditions clearly.

In developing recommendations in connection with detailed soil surveys complexes, where they are mapped, are the units to which yield estimates and soil management practices are related because where such areas are used all the taxonomic units are included within a field as cultivated by the farmer. Of course, data from the laboratory and experimental plots are synthesized by the individual taxonomic units.

Objective definition.--In the American system the classificational units shown on the detailed soil maps are defined objectively and are given names that do not, in themselves, connote genesis. This is regarded as important. Theories of soil genesis are still far from complete; in fact, they are continually changing. Since the classification is based upon definite soil characteristics it is not made obsolete by changes in genetic theories, nor is the classification prejudiced by such theories. It is regarded as essential that the classification be based upon characteristics of the soils, and not upon causes of the characteristics.

Present status and programs

Roughly, one-half of the arable land in the United States has been covered by detailed soil surveys. Many of the older maps are lacking in detail and accuracy as compared to the more recent ones. Schematic or reconnaissance soil surveys have been made of a large part of the country not covered by detailed surveys. There is no part of the United States for which we do not have some important information. Detailed soil surveys are needed for somewhat less than one-third of the country, say about 900,000 square miles. Better reconnaissance surveys are needed for around 500,000 square miles, and surveys that are partly detailed and partly reconnaissance for about 600,000 square miles. Reasonably adequate surveys are available for nearly 1,000,000 square miles, not including published surveys of Puerto Rico and one in preparation for Hawaii.

During the last 15 years the public use of soil surveys has increased enormously and determined efforts to complete the work are expected.

Essentially all of the soil survey work in the United States is carried on cooperatively between the U. S. Department of Agriculture and the soils research units in the State agricultural experiment stations. During recent years the State agricultural experiment stations have increased their contributions to the work in conformity with their increased use of it.

^{1/} In actual practice the name does not always include the word "phase." On many maps the actual range of slope is given in percentage instead of the words "rolling," "undulating," and so on.

This kind of cooperation is essential for a good program with satisfactory results. Scientists in the U. S. Department of Agriculture are especially concerned with the broad problems of classification throughout the country as a whole. Scientists in the State agricultural experiment stations are especially concerned with the local adaptation of the work to meet local needs, and with the coordination of the other research at the experiment station with that of the Soil Survey. Both types of interest and both kinds of skill are essential. Thus nearly every State has its soil survey program, and taken together, we have a well coordinated national program. For success, cooperation is necessary between scientists in the United States Department of Agriculture and scientists in the experimental stations, and also between the scientists engaged in soil survey work and those engaged in other agricultural research.

These developments have greatly increased the problem of training adequate scientists for soil survey work. First of all, they must be good general soil scientists, with extensive training in geology, chemistry, plant nutrition, and the other fundamental sciences as well as in soil science. But in addition to being good scientists they must be something more: they must have a balanced appreciation of science and of agricultural practice. Unless the work is sound scientifically it will not achieve its purpose. At the same time, the results must be interpreted in terms of practical agriculture in its broadest sense. The problem of recruiting young men with the necessary qualifications in science for this work, who are good cooperators and who have a keen sense of their practical obligations, is not an easy one.

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May 2: Montpellier ^{1/}

I am up at 7 o'clock and see that my watch has stopped so I hurry to get dressed and go over to the Metropole for breakfast and then find that I am much too early.

I have a talk with Dr. Edelman from Wageningen. He is Dean of the College and Director of the Soil Survey. He has 48 soils students this year. He tells me something about his work with grapes. He finds there is a very close relationship between the character of the soil and their growth. This introduces a difficult soil mapping problem. He says the surface texture is not very important, but that the grapes they grow in Holland are very particular about the water in the subsoil. The production will vary from 1 to 5 according to the soil conditions. The growers are now becoming very interested in the increased efficiency to be had from proper soil selection. He says they now have 2500 hectares of grapes under glass. He complains that they are very short of machinery made in the United States. It is too hard to get dollars to buy the machines.

After breakfast I stop and buy 2 French berets on the way to the university -- one for me and one for Robert.

^{1/} There will be no attempt to review in detail the papers given at the various conferences in Montpellier and Algeria since these will be published in a special volume by the French.

First we have some discussion of micro-climate, and one of the French presents a very detailed mathematical outline for each of the few stations studied.

Crowther of Rothamsted discusses organic matter. He points out that soil science has had very little effect on the practical use of organic matter in soil management. He thinks that possibly we are plagued with too many explanations, especially now with all of the speculation about hormones and vitamins, and so on. He makes the point that the decline in organic matter as the result of cultivation is often a symptom rather than a cause of changes in soil productivity. At Broadbalk field there has been fallowing every 5 years since 1925; especially the first year after the fallow there is a big increase in yield. He points out that about one-quarter of the nitrogen added in manure has remained in the soil by comparison with the unmanured plots. In this field manure has just maintained the organic matter. But when manuring stopped there was a great reduction, amounting to about one-half the nitrogen. Yet in rotations in Denmark the gain in nitrogen is about the same. He gives the following figures for gain in nitrogen after 50 years of manuring: Broadbalk, 27 percent, Woburn, 30 percent, and Linby, 32 percent. Thus much of the organic matter in manure must be quite resistant. Some oxidizes very rapidly and some very slowly. This calculation shows that at Broadbalk the total increase may be determined by the summation of the residues over

the years, by assuming that the residue would equal .15 of the amount added one year ago, plus 50% of the year before that, and so on. It is difficult to obtain these figures. We should need to regard, in practical experience, the effects of residues on crops that are not sensitive to organic matter. For example, the first year effect would not be the same on roots as on small grains. He thinks that we should set up experiments to try the effects of organic matter on all crops in rotation and arrange the experiments so that manure is put onto the various crops in all stages of their growth. He feels we need more long-time experiments along with analyses of the individual plant nutrients. At Rothamsted he is trying to sort out the total nutrient effects (see his table 6). He finds no benefit from the straw itself except in unusual cases. Potassium gave little effect when manure was used, but nitrogen did. Thus he thinks it is often incorrectly assumed that the nitrogen in a commercial fertilizer may be reduced when manure is used. In Britain he does not feel that it is generally wise to reduce nitrogen in fertilizer where manure is used. He finds 90 percent as much response to nitrogen, 50 percent as much to phosphorus, and 66 percent as much to potassium with manure as without it. Thus he says, somewhat contrary to the books, one may reduce the potassium and phosphorus when manure is used, but not the nitrogen. Of course, he points out that

The Study of Soil Organic Matter and Organic Manures
by means of Field Experiments

E.M. Crowther, Rothamsted Experimental Station, Harpenden, Herts.

TABLE 1 AND FIG.1:

Nitrogen percentages of Broadbalk Soils,
Rothamsted 1856-1945

(as percentages of air-dry fine soil 0-23 cms.)

Continuous wheat 1843 to 1925 and subsequently unmanured fallow every fifth year

Annual additions of farmyard manure (Plots 2A and 2B):

35 m. tons per ha. containing 224 kg. N

Annual additions of inorganic nitrogen (Plot 7):

96 kg. N per ha.

Plot	3	5	7	2B	2A
Manuring	None	PK	NPK	Farmyard manure from 1843	from 1885
Mean yield of grain (1852-1925) m.tons per ha	0.84	0.98	2.21	2.44	2.05 (1900-1925)
Nitrogen percentage of soil in:					
1865	0.105	0.106	0.117	0.175	-
1881	0.101	0.107	0.121	0.184	-
1893	0.094	0.101	0.115	0.213	0.136
1914	0.093	0.103	0.115	0.251	0.191
(after fallow every fifth year)					
1936	0.103	0.105	0.120	0.226	0.186
1945	0.105	0.106	0.123	0.236	0.194

Period of resting

1 year (4 years' cultivation)
2 years (3 years' cultivation)
3 years (2 years' cultivation)

35.6
36.9
42.0

(1) Effect of manure on soil N content
 (2) Effect of manure on soil N content
 (3) Effect of manure on soil N content
 (4) Effect of manure on soil N content
 (5) Effect of manure on soil N content

1945
1936
1914
1893
1881
1865

Table 6

Rothamsted single-year potato experiments 1940-5

Experiments on a new site each season

Rates of application:

Normal farmyard manure	20 and 40 m. tons per ha.
Straw farmyard manure	21.5 and 43 m. tons per ha.
Fertilizers	N 75 kg. per ha.
	P205 75 kg. per ha.
	K20 126 kg. per ha.

Potato yields in m. tons per ha.

	General Mean Yield	Mean Response to fertilizers			Mean Yield No NPK	Mean Yield With NPK
		<i>N</i>	<i>P</i>	<i>K</i>		
No farmyard manure	18.2	2.9	1.4	7.6	12.2	24.4
Normal farmyard manure	27.2	3.1	1.5	1.1	24.4	30.0
Straw farmyard manure	27.2	4.0	1.4	0.9	24.2	30.0

a) (NH₄)₂SO₄

Table 7

Residual Effects of Rotations on Yields of Potatoes
in Woburn Ley Experiment

Experimental treatments	1st year 2nd year 3rd year	Potatoes Wheat Sugar beet	Potatoes Wheat Hay	Three years' grazed ley	Three years' lucerne hay
<u>Yield of potatoes (1941-5) m. tons per ha.</u>					
Without farmyard manure		10.2	11.4	12.9	12.3
With farmyard manure		12.4	12.8	13.4	14.4
Mean		11.3	12.1	13.2	13.4

a) cut for hay.

Table 8

Soil Fertility Experiment, Serere, Uganda

Water-stable particles over 0.5 mm. as percentage of soil

Type of cover

Green manure, lopped	36.8
Green manure, dug in	36.9
Planted grass, lopped	39.0
Planted grass	39.1
Natural weeds and grass	39.2

grass adds organic matter as well as manure, but that the effects of these plants are much wider than simply the addition of the organic matter. This is especially obvious where trees and bushes are used for fallow in the tropics.

He brings forward additional data from Uganda showing the better effects on soil structure of grass than ordinary green manures. He emphasizes the need for comparing the effects of manure against the ash. In some places in Africa it has been found that the equivalent amount of ash is just as valuable as the manure itself. (Java also.) In those cases it wouldn't seem that the organic matter had much direct influence.

There is quite a bit of general discussion of this whole problem of organic matter following Mr. Crowther's paper. Either fortunately or unfortunately, there are no defenders present of such extremists as Sir Albert Howard.

About noon we go to a reception at the School of Agriculture in the University. We all listen to a long welcome speech in French with all the students along one side. Everybody stands. The wine is ready to serve, but the speech goes on! And on! Of course, like all speeches this one finally comes to an end; we drink our wine; go to lunch; and prepare for a field trip.

We drive out east of Montpellier in busses, and stop near the city in an old lime quarry to look at the Terra Rossa. This quarry is dug into a smooth, gently sloping hill. The



The cover is thin grass and shrub. The land has been badly eroded, but it is utterly impossible to determine how much. There are some stones on the surface and many exposed rock ledges. The land is now non-arable. Whether it ever had a deep solum I question. The profile we are shown is simply one within a broad crack. I doubt if it is really representative.

This is not a very good place to describe the soil and take a sample, partly because of the long speeches and large crowds of people. But I do the best I can. I think the samples are quite good, except possibly from the surface. There are all kinds of suggestions being made, especially by those who take no notes! Some opine that this profile is not even developed from the limestone, but I see no evidence that it is not.

Soil profile sample No. 1

A	0-5"	Very irregular brown clay loam soil obtained from the surface nearby.
A-B		Very irregular transition. (not sampled)
B ₁	10-50"	Reddish-brown clay, with fine irregular blocky structure; many roots; now very dry.
B ₂	50-80"	Reddish-brown clay with stones; well-developed small blocky angular structure; many roots. (Red when dry) ^{1/}
C	80" +	Reddish-yellow clay; imperfect small blocky structure; very irregular and sometimes absent.
D		Light gray hard limestone.

^{1/} Color names of dry samples added later where these are significantly different than the field designation.

The lower part of the section is a thin bedded sandstone, which is in places so thin as to be overlooked. There are some clasts of the sandstone and some exposed rock fragments. The sand is very fine-grained. Whether it is a deep water deposit is questionable. The strata we are shown in clearly are within a local area. I doubt if it is really representative. This is not a very good place to describe the soil and take a sample, partly because of the low frequency and large amounts of pebbles. But I do the best I can. I think the samples are quite good, except possibly from the surface. There are all kinds of suggestions being made, especially by those who take no notice! Some say that this profile is not even developed at first the limestone, but I see no evidence that it is not.

Section 1

Very irregular brown clay from soil collected from the surface nearby.	0-5"	A
Very irregular brown clay. (See section)	5-10"	B
Reddish-brown clay, silty, fine grained, low density structure; many roots; some very dry.	10-20"	C
Reddish-brown clay with pebbles; silty; developed soil, silty, many roots; some very dry.	20-30"	D
Reddish-brown clay; irregular and silty structure; very irregular and developed structure.	30-40"	E
Light grey hard limestone.	40-50"	F

✓ John notes at dry season that the soil is
significantly different from the field condition.

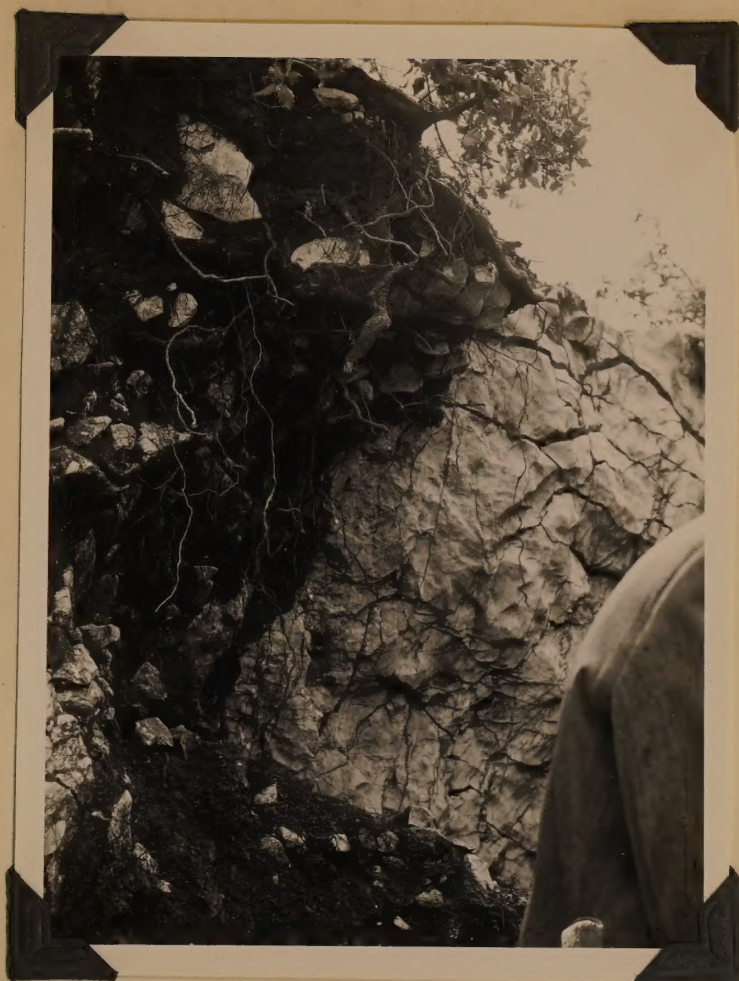
Terra Rossa (Soil Group)

Near Montpellier, Southern France

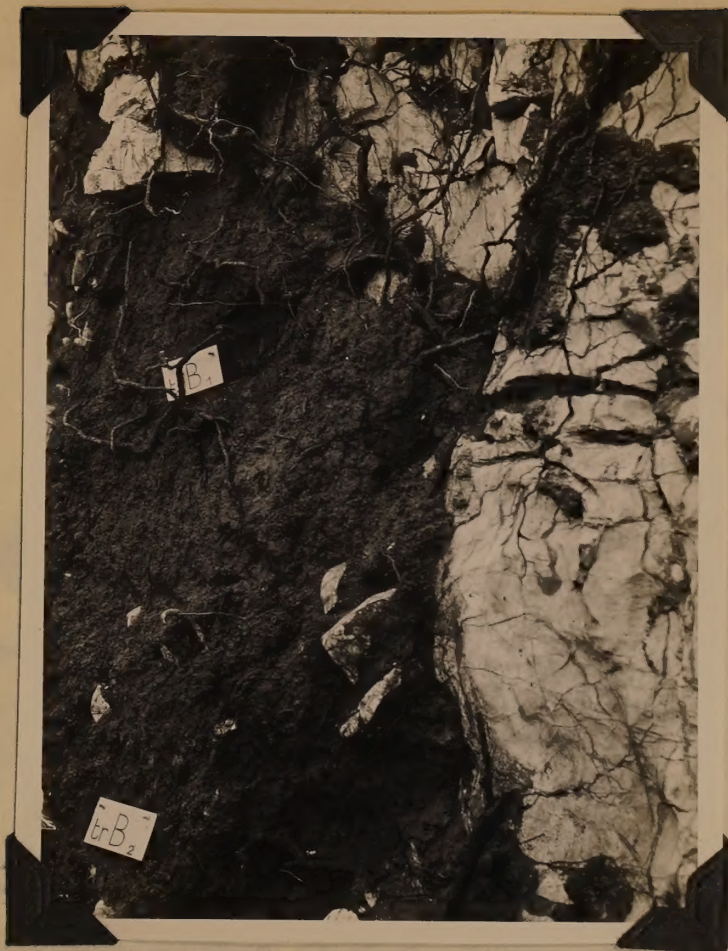
SAMPLE No.	HORIZON	DEPTH	pH	ORGANIC MATTER by H_2O_2	SIZE CLASS AND DIAMETER OF PARTICLES (in mm.)							OTHER CLASSES (in mm.)		
					Fine gravel, 2-1	Coarse sand, 1-0.5	Medium sand, 0.5-0.25	Fine sand, 0.25-0.1	Very fine sand, 0.1-0.05	Silt, 0.05-0.002	Clay, <0.002	0.02-0.002	<0.005	>2
No. 1 SL47France-1-1	A	0-5	7.6	4.2	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.
	1-2 B ₁	10-50	7.6	0.9	1.3	2.0	1.8	8.7	10.3	37.9	38.0	14.3	40.5	8
	1-3 B ₂	50-80	7.2	0.2	0.4	0.9	1.2	5.2	8.6	38.0	45.7	16.6	50.6	1
	1-4 C	80 +	7.5	0.2	0.3	0.6	0.7	3.0	8.2	43.5	43.7	19.0	49.0	<0.5
					2.0	2.6	1.3	2.6	5.9	29.1	56.5	14.2	61.2	<0.5
1-2 B ₁ 1-3 B ₂		10-50		21.8	Mg	Mn	K	Na	H	Sum of Cations	% Base Saturation			
		50-80		26.5	0.52	Tr	0.5	0.3	2.9	26.0	89			
					0.54	Tr	0.5	0.3	3.1	30.9	90			
				Soils were leached with neutral NH_4OAC				normal						
1-2 B ₁ 1-3 B ₂				Peak Temp.	Thermal Analysis		Kaolinite		Clay		Terra Rossa (Soil Group) Near Montpellier, Southern France			
		10-50		5570			25%							
		50-80		4610			25%							



K-1260 May 2, 1947
France. Near Montpellier.
Truncated stony Terra Rossa with soil in
deep wide cracks in hard limestone
(Site of sample No. 1.)



K-1261 May 2, 1947
France. Near Montpellier.
Truncated stony Terra Rossa, with soil
in deep wide cracks in hard limestone.
(A close view of soil in crack.)



K-1262 May 2, 1947
France. Near Montpellier.
Truncated stony Terra Rossa, with soil in
deep wide cracks in hard limestone. (A close
view.)



Crowther, Henin, and Pallmann.
(Photo by Pendleton.)



Bramao, Kellogg, and Muir. (Photo by Pendleton.)

100-4

4430



545-1

(Name, Address, and City, State, and Zip)



Boischot and Demolon. (Photo by Pendleton.)



Ogg and Raoul Cerighelli. (Photo by Pendleton.)

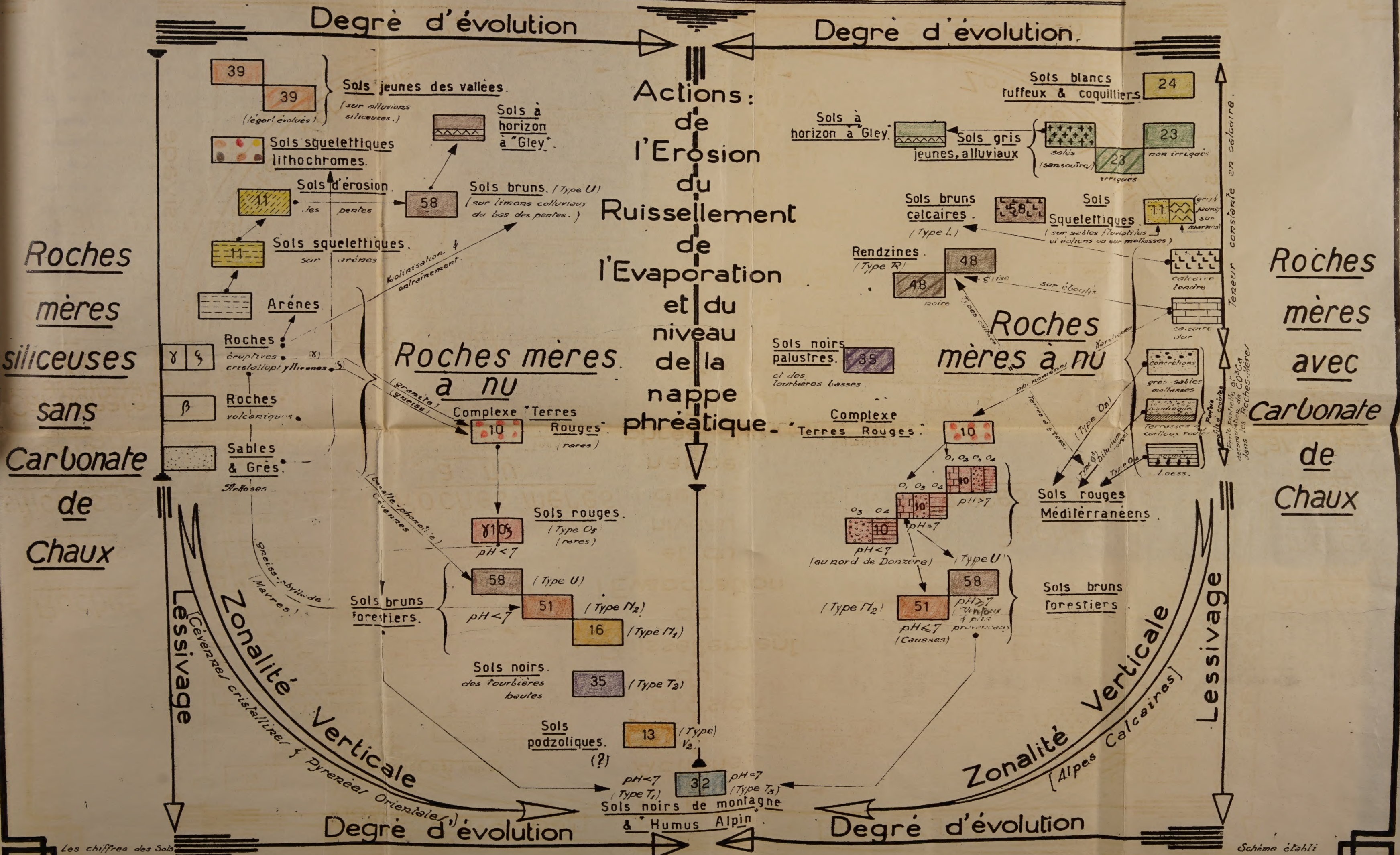
I am told that the A has a pH of 7.8, the B, 7.3 to 8.2, and the B₂, 7.4 to 8.3.

I take a sample of the principal grass growing above the quarry Brachypodium namosium. Bramao says this soil is quite similar to the Almoster series in central Portugal.

We drive to another soil near Montpellier called locally "yellow" soil. The landscape suggests a dissected terrace. A little higher up there has been some colluvial wash deposited, but not here. The land is undulating but has been rather badly eroded in the past, with a fair development of pavement. Originally the climax vegetation was probably oak (Quercus ilex). This land was originally cleared and used by the Romans. Erosion has progressed so far that one is uncertain of the original profile. The land could easily be used with proper methods. It is a pity that it is so badly handled. The vegetation is grass, thyme, various aromatic shrubs, and small pines, some of which are used for turpentine. Bramao says that this is similar to their Secorio of Portugal. I should call this an immature imperfectly drained Brown Forest soil. Certainly it should be not called a "yellow" soil.

SOLS de la REGION MEDITERRANNEENNE et de sa bordure montagneuse

Classification de l'Association Française pour l'Etude du Sol.



Les chiffres des Sols
correspondent aux 17^{es}
des crayons "Conté".

Schéma établi
par J. BORDIER
3/1/47

Soil profile sample No. 2

- | | | |
|----------------|--------|--|
| A ₁ | 0-2" | Brownish-gray clay loam with only a little organic matter; somewhat granular. (Pale brown when dry.) |
| A ₂ | 2-9" | Slightly yellowish, brown clay; slightly rounded, small angular nut. (Light brown to pink when dry.) |
| A ₃ | 9-18" | Like the above but somewhat more yellowish. (Yellow when dry.) |
| B | 18-30" | Gray and pink mottled clay, with rounded coarse blocky structure. |
| C | 30" + | Mottled, pink, gray, and yellowish-brown marly clay; laminated a little. |

Both B and C show some glei effect.

It is certainly very difficult, in fact, utterly impossible, to write proper notes while examining soils with such an extremely large party of people, some of whom are not too interested themselves.

We go to another quarry pit and see a Terra Rossa soil much like that seen earlier. Here there has been a quarry of limestone for many years. It is a bad place to look at the soil.

Much of Montpellier is a very pretty city, with old houses typical of southern France -- iron work, yellow plaster, red tile roofs, stone walls, beautiful rose gardens, and evergreen trees, including palms. Certainly there is no part of the world more beautiful than southern France.



SECRETARIAT

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MONTPELLIER, le 22 Avril 1947

Monsieur Ch.E. K E L L O G
Chief of the Division of Soil Survey
Plant Industry Station
BEITSVILLE MARYLAND

A l'occasion du Congrès de Pédologie qui doit avoir lieu dans notre Ville le 5 Mai prochain, la Municipalité offrira un apéritif d'honneur aux Congressistes ce même jour à 18 H. 30 dans la cour de l'Ecole des Beaux-Arts.

Je serais heureux que vous veuillez bien assister à ce vin d'Honneur.

Le Maire,

P. BOULET



K-1263 May 2, 1947 France. Near Montpellier.
Landscape of immature, imperfectly drained Brown Forest
soil, called locally "yellow" soil. Now badly eroded.
Originally had oak forest (Quercus ilex) cleared by early
Greeks or Romans. Now has thyme, various aromatic shrubs,
and small pines. (Site of sample No. 2)



K-1264 May 2, 1947 France. Near Montpellier.
Soil used for grapes a few yards away from that described
above.



France. At a profile near Montpellier. Reifenberg and Henin in front. (Photo by Pendleton.)



K-1265 May 2, 1947
 France. Near Montpellier. Terra Rossa in
 cracks in hard limestone in old quarry.

At 6:45 we go to a reception by the Chamber of Commerce of Montpellier just as we come from the field. I am very tired and have with me all my soil samples, cameras, and so on. Again there are many pretty speeches in French -- too many speeches -- and one must stand for all of them. Finally we are served some good wine from the Chamber. Just as I go back to the Hotel Metropole for dinner at 8:00 p.m., I discover that someone has made off with my good tobacco pouch!

I go directly to my hotel room after dinner, label the samples, and into bed.

May 3: Montpellier

I am up very early for the conferences at the University because this is said to be a very long day. First we have a discourse on soils and vegetation. This speaker shows many profiles from the Swiss Alps; the paper is interesting, but he talks and talks and talks.

I feel that many Europeans spend too much time in the office in speculation and not enough time in the field. They want everything to be logical. The result is that they cut down the universe to the point where they can handle it, and then when they go out into the field with the principles they have developed so logically, they don't fit because they trimmed their real universe in the first place. I have had some talks with

Bramao about his work in Portugal, and I think that he is going to avoid this difficulty.

Wallace from the United Kingdom gives a most excellent discussion on mineral deficiencies. (This paper should be read in the proceedings since it is one of the most important of the Conference.) He points out that boron is more likely to be deficient under drought conditions. Iron deficiency may be caused by the simple lack of iron, or due to excess calcium carbonate, either naturally or as added. It may be due to the excess of other nutrients or it may be caused by deficiencies of the other nutrients.

Manganese, he says, may induce iron deficiency, or may have direct toxic effects not related to iron. He points out that high manganese in acid soils may induce iron deficiencies. He points out that most of the minor elements are low in soils of high pH except for molybdenum. High potassium induces magnesium deficiency. If zinc is in excess and iron is high in plants, extra iron sprayed on the leaves will cure the difficulty.

In his paper Wallace goes through a great many of these relationships quite rapidly.

At 11:15 a.m. we go into busses in order to drive to St. Guilhem. It is raining. We pass over much eroded limestone upland. Most of these slopes are now non-arable because of the limestone ledges. Many of the upper slopes have old ruined stone terraces on abandoned land. The chief vegetation is thin

grass and aromatic shrubs 5 to 30 inches high. Now there are lots of beautiful flowers growing among the stones. One sees very few animals.

The better areas on gentle slopes are almost all used for wine grapes grown under clean cultivation in monoculture.

There are almost no efforts right here to control erosion. The lower slopes, and especially the stream terraces, are largely devoted to vines, although there are some grain and vegetables.

We pass through St. Martin. Near the town are many very small gardens on pockets of the deeper soil. These have potatoes and other vegetables. The higher slopes are limestone. Generally, those over 7 percent are completely covered with ledges and loose stones with plants growing in the cracks among the rocks. This condition extends down into lower slopes of only 3 percent. I wonder about the question: how much erosion? There is no way to know what the original soil was like. Certainly these hilly areas are stabilized now but without continuous surface soil -- the soil is only in the cracks -- I feel certain that there has been some serious accelerated erosion. Yet I am equally certain that many of these slopes probably never had much more soil than they have now.

Most of the upland northwest of St. Martin is rough stony land. I doubt if there was ever much arable soil in this region. Probably a great deal of it at one time had a heavy forest of big oaks. I take a picture along the margin of a stream -- a

sort of strath terrace that likely once had more soil which has since been washed away. The vegetation is now scattered oak in a park-like distribution along with shrubs, thyme, and thin grass grazed by sheep. The surface is protected by a thin erosion pavement. Lower, there is a stream terrace with dark reddish-brown loam, and then beyond the stream there is again stony land with Terra Rossa in the pockets.

It continues to rain as we go along the gorge of the Hérault River. We come out of the gorge onto a plateau near Causse. Here there are grapes growing on rather stony Terra Rossa. In some places the stones have been picked up into piles. The main street of this village is so narrow that we scarcely get through with the bus. Many old small fields that were terraced with stones are now abandoned. Others have vines and fruit trees. I think there are some mulberry trees.

We go south of Causse and again see the gorge of the Hérault River a little north of St. Guilhem. Here in the limestone one sees some palisades slightly resembling basalt. Along the road are very small cultivated fields, some with terraces and some without on the lower slopes. The crops are mostly vines and olives.

We stop for lunch in St. Guilhem at 2 o'clock. There is more than the usual confusion. For lunch there is egg salad, meat paste, olives in abundance, white sour wine, brown bread (I eat more bread here in a day than in a month in the U.S.A.),



K-1266 May 3, 1947 France. Near Montpellier, northwest of St. Martin. A stony stream terrace with a few specimens of scattered oaks like those of original forest (Quercus ilex), along with thyme, aromatic shrubs, and thin grass grazed by sheep.



K-1267 May 3, 1947 France. Northwest of Montpellier near gorge of Hérault River. Limestone land with small oaks and shrubs.



K-1268 May 3, 1947 France. Northwest of Montpellier near gorge of Hérault River. Limestone land with small oaks and shrubs.



K-1269 May 3, 1947 France. Northwest of Montpellier near gorge of Hérault River. Limestone land with small oaks and shrubs.

rather poor red wine, mushroom omelet, roast beef, potatoes, asparagus, blue cheese, ice cream, champagne, muskatel, brandy, and finally coffee. The lunch takes nearly 3 hours. There are many toasts and an enormous waste of time.

We go south along the river. There are olives and grapes on low terraces on the lower slopes, but only a little of the land is arable. Many of the old stone terraces are abandoned.

We stop at a picturesque spring where there is a dam and the water is taken out by concrete ditches for irrigation of vegetable crops far down on the lower plain. We come down onto this lower plain. It is an old brown alluvial soil devoted mainly to vines, but with some irrigated vegetables, and some olives not irrigated.

As we come near to Montpellier we go through a small valley of alluvial soils accumulated from the eroded products of Terra Rossa. This seems to be an excellent soil for grapes. Of course, the grapes here are severely pruned in February. Most of those in the pictures are about 20 years old.

At about 7:30 we stop at a cooperative "cave" (wine cellar) at Murbiel, near Montpellier. We are served some deep red wine that is said to be very good, although it is too sour for me. This village is on dark brown soil that is probably some variety of Terra Rossa. The relief is undulating to rolling. The soil is in a good state of cultivation and is almost wholly used for wine grapes. The fields are relatively



K-1270 May 3, 1947
 France. South of St. Guilhem. Old stone bridge
 between big spring and river.

small and are bordered with old stone-walled terraces 3 to 6 feet high. I see a few olive trees and a few fields of small grain. By the time we finish here it is nearly dark and cold and wet.

We get back to Montpellier for a very late dinner and then find that we are supposed to go to the cinema to see a special farm film, the theme of which seems to be "keep everything pregnant." I am so tired and sleepy that I need to leave before it is finished and go to bed at midnight.

May 4: Field trip to Mt. Aijoual

We are up early for a field trip to the mountains again. We start out over stony eroded Terra Rossa in the country south of les Matelles. Most of this land is used for winter sheep pasture. As we go up into the highlands there is more vegetation and more good terraced fields, some of which are on very steep slopes. In the highlands the pasture is better. The natural terraces are very narrow. We see some beautiful valley farms. The main crop is wine grapes, although there are some apples and a few animals.

We again pass by the Hérault River near LeVigan. The rocks here seem to be some kind of schist at the very edge of the "Massive Central." From the bus, the soils appear to be Brown Forest, but perhaps they are not. The bus shakes so that I can scarcely write at all. There are well terraced



K-1271 May 4, 1947
France. Near L'Espérou, north of Montpellier. View of
hilly brush land.



K-1272 May 4, 1947
France. Near L'Espérou, north of Montpellier. View of
hilly brush land.

little fields with fruits and vegetables on slopes up to 10 percent. Some of these fields are only 6 feet wide; others are up to 100 feet. The soils in the fields are stony (flaggy), and grayish-brown. There are some olives and Spanish chestnuts (grown for the nuts). As we go on into the highlands there are better farms with terraces in good repair.

About 15 kilometers south of L'Espérou I take some pictures, and a little further north examine a profile on the edge of the mountain developed from schist. Certainly this is a Brown Forest soil. There is a nearly pure stand of chestnut which was said to have been planted on an old eroded slope a few years ago. The slope is about 25 percent.

Soil profile sample No. 3

- A₀ -- Very thin; mainly mosses on the immediate surface.
- A₁ 0-10" Very dark brown silt loam rich in humus.
(Dark reddish-brown when dry)
- B 10-24" Brown, heavy silt loam with granular and weak fine blocky structure. (Light reddish-brown when dry.)
- C 24-48" Pale olive rotten schist.
- D 48" + Schist.

Roots penetrate the soil deeply. The vegetation is fairly open forest with considerable grass and ground cover. According to the French the soil is somewhat acid and they regard it as slightly degraded. Like all mountain soils, the

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No.	Name	Depth	X	Y	Z	W	V	U	T	S	R	Q	P	O	N	M	L	K	J	I	H	G	F	E	D	C	B	A	Z	Y	X	W	V	U	T	S	R	Q	P	O	N	M	L	K	J	I	H	G	F	E	D	C	B	A	Z	Y	X	W	V	U	T	S	R	Q	P	O	N	M	L	K	J	I	H	G	F	E	D	C	B	A	Z	Y	X	W	V	U	T	S	R	Q	P	O	N	M	L	K	J	I	H	G	F	E	D	C	B	A	Z	Y	X	W	V	U	T	S	R	Q	P	O	N	M	L	K	J	I	H	G	F	E	D	C	B	A	Z	Y	X	W	V	U	T	S	R	Q	P	O	N	M	L	K	J	I	H	G	F	E	D	C	B	A	Z	Y	X	W	V	U	T	S	R	Q	P	O	N	M	L	K	J	I	H	G	F	E	D	C	B	A	Z	Y	X	W	V	U	T	S	R	Q	P	O	N	M	L	K	J	I	H	G	F	E	D	C	B	A	Z	Y	X	W	V	U	T	S	R	Q	P	O	N	M	L	K	J	I	H	G	F	E	D	C	B	A	Z	Y	X	W	V	U	T	S	R	Q	P	O	N	M	L	K	J	I	H	G	F	E	D	C	B	A	Z	Y	X	W	V	U	T	S	R	Q	P	O	N	M	L	K	J	I	H	G	F	E	D	C	B	A	Z	Y	X	W	V	U	T	S	R	Q	P	O	N	M	L	K	J	I	H	G	F	E	D	C	B	A	Z	Y	X	W	V	U	T	S	R	Q	P	O	N	M	L	K	J	I	H	G	F	E	D	C	B	A	Z	Y	X	W	V	U	T	S	R	Q	P	O	N	M	L	K	J	I	H	G	F	E	D	C	B	A	Z	Y	X	W	V	U	T	S	R	Q	P	O	N	M	L	K	J	I	H	G	F	E	D	C	B	A	Z	Y	X	W	V	U	T	S	R	Q	P	O	N	M	L	K	J	I	H	G	F	E	D	C	B	A	Z	Y	X	W	V	U	T	S	R	Q	P	O	N	M	L	K	J	I	H	G	F	E	D	C	B	A	Z	Y	X	W	V	U	T	S	R	Q	P	O	N	M	L	K	J	I	H	G	F	E	D	C	B	A	Z	Y	X	W	V	U	T	S	R	Q	P	O	N	M	L	K	J	I	H	G	F	E	D	C	B	A	Z	Y	X	W	V	U	T	S	R	Q	P	O	N	M	L	K	J	I	H	G	F	E	D	C	B	A	Z	Y	X	W	V	U	T	S	R	Q	P	O	N	M	L	K	J	I	H	G	F	E	D	C	B	A	Z	Y	X	W	V	U	T	S	R	Q	P	O	N	M	L	K	J	I	H	G	F	E	D	C	B	A	Z	Y	X	W	V	U	T	S	R	Q	P	O	N	M	L	K	J	I	H	G	F	E	D	C	B	A	Z	Y	X	W	V	U	T	S	R	Q	P	O	N	M	L	K	J	I	H	G	F	E	D	C	B	A	Z	Y	X	W	V	U	T	S	R	Q	P	O	N	M	L	K	J	I	H	G	F	E	D	C	B	A	Z	Y	X	W	V	U	T	S	R	Q	P	O	N	M	L	K	J	I	H	G	F	E	D	C	B	A	Z	Y	X	W	V	U	T	S	R	Q	P	O	N	M	L	K	J	I	H	G	F	E	D	C	B	A	Z	Y	X	W	V	U	T	S	R	Q	P	O	N	M	L	K	J	I	H	G	F	E	D	C	B	A	Z	Y	X	W	V	U	T	S	R	Q	P	O	N	M	L	K	J	I	H	G	F	E	D	C	B	A	Z	Y	X	W	V	U	T	S	R	Q	P	O	N	M	L	K	J	I	H	G	F	E	D	C	B	A	Z	Y	X	W	V	U	T	S	R	Q	P	O	N	M	L	K	J	I	H	G	F	E	D	C	B	A	Z	Y	X	W	V	U	T	S	R	Q	P	O	N	M	L	K	J	I	H	G	F	E	D	C	B	A	Z	Y	X	W	V	U	T	S	R	Q	P	O	N	M	L	K	J	I	H	G	F	E	D	C	B	A	Z	Y	X	W	V	U	T	S	R	Q	P	O	N	M	L	K	J	I	H	G	F	E	D	C	B	A	Z	Y	X	W	V	U	T	S	R	Q	P	O	N	M	L	K	J	I	H	G	F	E	D	C	B	A	Z	Y	X	W	V	U	T	S	R	Q	P	O	N	M	L	K	J	I	H	G	F	E	D	C	B	A	Z	Y	X	W	V	U	T	S	R	Q	P	O	N	M	L	K	J	I	H	G	F	E	D	C	B	A	Z	Y	X	W	V	U	T	S	R	Q	P	O	N	M	L	K	J	I	H	G	F	E	D	C	B	A	Z	Y	X	W	V	U	T	S	R	Q	P	O	N	M	L	K	J	I	H	G	F	E	D	C	B	A	Z	Y	X	W	V	U	T	S	R	Q	P	O	N	M	L	K	J	I	H	G	F	E	D	C	B	A	Z	Y	X	W	V	U	T	S	R	Q	P	O	N	M	L	K	J	I	H	G	F	E	D	C	B	A	Z	Y	X	W	V	U	T	S	R	Q	P	O	N	M	L	K	J	I	H	G	F	E	D	C	B	A	Z	Y	X	W	V	U	T	S	R	Q	P	O	N	M	L	K	J	I	H	G	F	E	D	C	B	A	Z	Y	X	W	V	U	T	S	R	Q	P	O	N	M	L	K	J	I	H	G	F	E	D	C	B	A	Z	Y	X	W	V	U	T	S	R	Q	P	O	N	M	L	K	J	I	H	G	F	E	D	C	B	A	Z	Y	X	W	V	U	T	S	R	Q	P	O	N	M	L	K	J	I	H	G	F	E	D	C	B	A	Z	Y	X	W	V	U	T	S	R	Q	P	O	N	M	L	K	J	I	H	G	F	E	D	C	B	A	Z	Y	X	W	V	U	T	S	R	Q	P	O	N	M	L	K	J	I	H	G	F	E	D	C	B	A	Z	Y	X	W	V	U	T	S	R	Q	P	O	N	M	L	K	J	I	H	G	F	E	D	C	B	A	Z	Y	X	W	V	U	T	S	R	Q	P	O	N	M	L	K	J	I	H	G	F	E	D	C	B	A	Z	Y	X	W	V	U	T	S	R	Q	P	O	N	M	L	K	J	I	H	G	F	E	D	C	B	A	Z	Y	X	W	V	U	T	S	R	Q	P	O	N	M	L	K	J	I	H	G	F	E	D	C	B	A	Z	Y	X	W	V	U	T	S	R	Q	P	O	N	M	L	K	J	I	H	G	
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profile is quite irregular and very thin in places. This seems to me to be Brown Forest soil tending a little toward Mountain Meadow. This profile was taken a few kilometers west of Valler-Augue.

We go on further and higher into the mountain. The vegetation includes spruce and larch, and we finally pass into Alpine Meadow at the Observatory of Aijoul. Here the elevation is about 1500 meters, and from the top of the mountain one can see the Pyrenees, the Alps, and the Mediterranean Sea.

It would be correct to refer to the soil here as Mountain Meadow, but it seems to me to be too black for what I regard as Alpine Meadow. The color reminds one of the soil on Bald Top Mountain in the Appalachians. A little further down the side of the mountain, on a slope of about 5 percent, I look at a soil profile cut up into grasses, sedges, and mosses where there are now no trees or shrubs. There is a large crowd and great haste, but I try to get a sample as best I can. Generally, the soil is a black very fine sandy loam to silt loam with very little horizon differentiation in the 30-40" above the rock.

Soil profile sample No. 4

- | | | |
|-----------------|--------|---|
| A ₁₁ | 0-3" | Black very fine sandy loam to silt loam; many roots form heavy turf. |
| A ₁₂ | 3-12" | Black very fine sandy loam, with some roots. (Very dark brown when dry.) |
| B (?) | 12-30" | Black very fine sandy loam to silt loam with some very coarse sand. (Very dark reddish-brown when dry.) |

SAMPLE No.	HORIZON	DEPTH	pH	ORGANIC MATTER by H ₂ O ₂	SIZE CLASS AND DIAMETER OF PARTICLES (in mm.)								OTHER CLASSES (in mm.)		
					Fine gravel, 2-1	Coarse sand, 1-0.5	Medium sand, 0.5-0.25	Fine sand, 0.25-0.1	Very fine sand, 0.1-0.05	Silt, 0.05-0.002	Clay, <0.002	0.02-0.002	<0.005	>2	
No. 4				Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	
	S47France-4-1	A ₁₁	0-3	5.4	17.5	6.8	11.6	5.7	13.5	15.3	33.5	13.6	17.3	18.2	4
	4-2	A ₁₂	3-12	4.5	15.1	4.3	13.3	5.8	13.1	13.5	34.7	15.3	18.1	19.9	<0.5
	4-3	B (?)	12-30	4.7	8.7	11.5	18.7	7.0	12.7	10.6	28.3	11.2	15.1	15.1	4
4-4	C	30-32	5.5	0.2	30.5	32.3	12.2	15.5	4.3	4.7	0.5	2.4	1.6	28	
4-1	A ₁₁	0-3		% Carbon					Mountain Meadow	-	Near Observatory of Aijoual, in				
4-2	A ₁₂	3-12		9.15											
4-3	B(?)	12-30		7.85											
4-4	C	30-32		4.85											
				0.17											



K-1273 May 4, 1947
France. Near L'Esperou. View of cover, nearly pure
chestnut, on Brown Forest soil, tending toward Mountain
Meadow, from schist. (Site of sample No. 3.)



Dr. Braun-Blanquet explaining the Brown Forest soil.
(Photo by Pendleton.)



K-1274 May 4, 1947 France. View of Mt. Aijoul. 1500 meters elevation. From this point one may see the Alps, the Pyrenees, and the Mediterranean Sea. The soil is near Alpine Meadow.



K-1275 May 4, 1947. France. View of Mt. Aijoul. 1500 meters elevation. From this point one may see the Alps, the Pyrenees, and the Mediterranean Sea. The soil is near Alpine Meadow. (A close view of the surface with some snow.)

L'Espéron le 4 Mai 1947

CONGRES de PEDOLOGIE

XX

MENU

HORS D'OEUVRES

Pâté Tête de Porc

Saucisson Beurre

Allumettes aux Anchois

Nymphes des Torrents de L'Aigoual
Belle-Meunière

Roti de Veau

Pommes Chipp

Asperges en Branches

Fromage

Pots de Crème

Nota- Ne remarquez pas trop le matériel
actuel. Il remplace notre beau matériel
parti aux F.F.I. mais toujours impayé.....
Nous comptons que les nymphes par leur
saveur, vous dédommageront.

C 30-32" Speckled rotten granite, not every where present.

D 32" + Granite.

The soil has an excellent soft, fine granular structure above the C. There are roots throughout the profile but these are concentrated in A₁. (The guide book lists the vegetation in detail.) Such soils as the one described are found in the wind-swept areas. The more sheltered places have heath and forests. The grasses on these black soils are dense but short. The land is now grazed by sheep.

We hurry back to L'Espérou for lunch at 2 o'clock. This lunch is the same story as yesterday. After much eating and drinking of wine with toasts, the party rises at 5:30 and leaves on the road to Col du Miner and le Vigan. At first we pass through some fair forest of spruce where telephone poles are being cut. We see some Brown Forest soil on granite where the winds are obviously strong and limit tree growth. The lunch was so long that most of the people show the effects of the wine and would rather sing than look at soils!

Here and there I see some fair forest on these strong slopes of granite. In the coves the land is terraced and good grass is produced. Most of the villages in this region have very narrow streets. We are travelling in big busses and have a good deal of difficulty making the turns even on the main roads through the towns. We stop for a moment at

U 35-12" Gravel, not every where present.

U 35-12" Gravel.

The soil has an excellent soil, this gravelly structure above the G. There are roots throughout the profile but these are concentrated in A₁. (The guide book lists the vegetation in detail.) Such soils as the one described are found in the wind-swept areas. The more sheltered places have forest and forest. The grasses on these black soils are dense and short. The land is now grazed by sheep.

We hurry back to the station for lunch at 2 o'clock. This lunch is the same story as yesterday. After lunch walking and drinking of wine with friends, the party starts at 3:30 and leaves on the road to Col du Minier and Le Vignier. At first we pass through some fair forest of spruce where telephone poles are being cut. We see some brown forest soil on granite where the winds are obviously strong and limit tree growth. The lunch was so long that most of the people show the effects of the wine and would rather sing than look at walls.

Here and there I see some fair forest on grassy slopes of granite. In the cover the land is forested and good grass is produced. Most of the villages in this region have very narrow streets. We are travelling in big buses and have a good deal of difficulty making the turns even on the main roads through the towns. We stop for a moment at

LeVigan and reach Montpellier at 9:15. I skip dinner, fix up my soil samples, and go to bed very tired.

May 5: Montpellier

This is a beautiful morning. I go out to the University for the last day of conferences at Montpellier.

Dr. Edelman discusses the problem of flooded land in Holland. Where the land had been flooded with salty water he had found it practicable to use up to 12 tons of gypsum per hectare. The amounts were sometimes only 3 to 4 tons on the sandy soils. It was quite a problem for them to obtain enough gypsum in western Europe. After the bombing of the dykes, principally by the RAF, they first had enormous erosion. Some of the erosion channels were 20 to 30 meters deep. It was necessary for them to make detailed soil maps showing these conditions very accurately. In the flooded areas they make their maps at a scale of 1:5,000 or 1:10,000, and the generalized maps at 1:25,000. In some places the sediments were deposited over peat. At first, these were high places but as the peat became compressed, these areas became settled and became the channels for creeks. Then the creeks filled with sand, and these places again became the high places. It is very difficult to drain these areas without spoiling the sandy soils. In arranging the farms it is very important that the small farms be on good soil, whereas the large farms can use economically a

mixture of good and poor soils.

Many of the soils become acid in the surface because of occasional inundations of salty water. The sodium replaces the calcium. It is hard to say whether or not one should call this podzolization where the soils develop a rather high lime requirement.

Five hundred thousand tons of gypsum have been used. With this treatment they can get the soils back to normal in 4 or 5 years; without it more than 20 years is required.

Edelman stresses the point that the study of alluvial soils is in the field of pedology rather than geology. He feels that geologists can't make a very good contribution and that soil scientists have neglected them too much. I am much impressed with Edelman's scientific ability and with his social and practical point of view of the place of soil science in the scheme of things.

Henin read a paper on soil minerals, which included a rather good review of contemporary opinion. I go to lunch at 1:30 and then back to the University for a group picture at 3:05. Afterward the conference continues.

Bramao gives a good discussion of the soils of Portugal. I am well impressed with the progress he is making. Obviously he benefited greatly from his experience and training in the United States. M. LeBrun from INEAC in Brussels presents a summary of a paper by Professor Baeyens reviewing his work.

This will need to be seen in the Proceedings since it is too compact for summary.

Reifenberg of Palestine, discusses the different ratios of anions to cations absorbed by plants, and the effect these have on the pH of the medium. The discussion brings out the difficulties of reasoning from effects of this kind noted in water cultures and sand cultures as applied to soils.

Joffe of New Jersey, presents a "new" scheme for determining how the yields of crops may be increased on soils. This is quite a nightmare. According to him, chemical tests are no good, and he has settled a great many serious problems without them. First of all, he makes a profile. Many of the problems can be settled at once by examining the profile, including a good record of its odors! If the questions can't all be answered from this examination, water extracts may be made on which he determines pH and conductivity. From these results one may recommend the proper fertilizers. He says if no chloride ions are present, potassium is necessary; if no sulphate ions are present, phosphorus is necessary. He also tests for crenic or apocrenic acids. He emphasizes that the samples must be taken and the tests made within 15 to 20 minutes. Joffe says that he can solve entirely satisfactorily 95 percent of the large number (sic) of problems that come to him. I understand that he is going to Palestine this summer for the purpose of installing this scheme as a regular



Group picture of Conference at Montpellier

P-XI A

procedure in one of the Palestine agricultural experimental stations!

After these sessions we go to the local art gallery, which is quite good. Then we have dinner and later a reception by the faculty of letters of the University. There is folk and ballroom dancing, and a special reception with champagne for the delegates. A large crowd is still here when I leave about midnight in order to do some packing, since we have to get away early in the morning.

May 6: Montpellier to Nîmes

I am up at 5:30 to finish packing. After an early breakfast we leave in the busses for another field trip. This promises to be a very nice day. Not far from Montpellier we stop to look at a cultivated red soil on a well established high terrace, said to be of the Pleistocene period. The surface part is said to be overwash, and this is suggested by the gravelly layers beneath. The slope is about 1 percent. The land is devoted to grapes in clean cultivation. The area is near an old Roman road and is said to have been cultivated for around 2000 years.

...in the ... of the ...
...

After these sessions we go to the local art gallery, which
is quite good. Then we have dinner and have a reception by
the faculty of letters of the University. There is talk and
delicious lunch, and a special reception with champagne for
the delegates. A large crowd is still there when I leave
about midnight in order to do some packing, since we have to
get away early in the morning.

May 6: Pontefract to Leeds

I am up at 5:30 to finish packing. After an early breakfast
I go to leave in the morning for another field site. This
morning is a very nice day. Not far from Pontefract we
stop to look at a cultivated red soil as a well exposed
high terrace, said to be of the Pleistocene period. The soil
is said to be overwash, and this is represented by the
gravels layers beneath. The slope is about 1 percent. The
field is devoted to crops in clean cultivation. The area is
near an old Roman road and is said to have been cultivated
for about 2500 years.

CONFERENCE INTERNATIONALE DE PEDOLOGIE

MEDITERRANEEENNE

Mardi 6 Mai

Costière et Garrigues de Nîmes

ITINERAIRE

Matinée - A la sortie de Montpellier, au nord de la route de Nîmes, garrigues jurassiques (pli de Montpellier); au Sud, terres sableuses du Pliocène Astien.

A partir du croisement avec la route du Puy, apparition, au sud de la route de Nîmes, des terres rouges qui la borderont bientôt à gauche et à droite jusqu'à Lunel.

Terres colluviales; cailloutis rhodaniens rubéfiés et Pliocène Astien qui prend aussi la teinte route à St. Brès, les cailloutis pénètrent dans les fissures du calcaire jurassique. Sol de lehm sur sables jaunes, accumulation de calcaire au-dessus de ceux-ci. Cailloux rhodaniens et pisolithes de limonite provenant de l'Egène voisin (1er arrêt)

Après Lunel, terres grises des alluvions modernes du Vidourle.

Après celui-ci, la route est bordée à gauche et à droite par des terres sèches de couleur claire faites aux dépens d'un complexe loessique avec éboulis de côteaux abondants et intercalations de couches rouges, accumulation calcaire (sistre ou taparas).

A. P. Marais
Après ~~Vestrie~~, terres alluviales grises du Vistre, puis la Costière; parties planes au pied des collines, terres colluviales (cailloutis et sables jaunes). A vauvert au "rode di Poulets" (2ème arrêt) succession des formations superficielles en Costière (Voir l'Etude : Observations sur des terres et des sols) de Vauvert à Bellegarde par le Château de Beck et Gallician-Franquevaux (Voir travaux de Denizot pour la Costières). plaine basse au pied de la Costière, cailloutis calibrés (gresillon).

A St. Gilles, (3ème arrêt), gravière de la villa comtoise; cailloutis clairs passant aux sables jaunes; migrations du fer et du calcaire; au sommet : cailloutis rouges (le gapan).

Entre St. Gilles et Bellegarde, grande carrière de marnes plaisanciennes.

Au-dessus de la route, côte de marnes et sables, surmontées par le gapan et, tout au sommet par le cailloutis blond.

A Bellegarde, au kilomètre II, 5 à la gravière :

4me arrêt - Laparas et ligne blanche (6)
5me - Loess et lehm - 1
6me - gravière: cailloutis clair, loess, gapan (8)
migration du fer et du calcaire, horizon supérieur de calcaire.

(Voir observations, analyses, etc..... de Bordas)
de Bellegarde à Nîmes, 7ème arrêt après le mas St. Louis Etude d'un sol forestier.

.....

Soirée -

Sommet de la côte de Cabrières, terres rouges sans épaisseur sur le calcaire urgonien (1er arrêt) 2me arrêt sans quitter le car : coup d'oeil sur les rideaux loessiques.

Collias, tranchée de loess, sol sur loess (3me arrêt)
(Voir Observations et analyses de Bordas.)

Pont du Gard (4me Arrêt) - SITE; abri sous roche paléolithique de la Salpêtrière, éboulis de côteaux.

Lédénon, après le village à l'aller (5me arrêt) loess non remanié; après le village, au retour (6me arrêt) loess remanié, croutes, couches rouges.

Sur la route de Nîmes, après le croisement de la route de Lédénon (7me arrêt), éboulis de côteaux et croutes calcaires.

En résumé, cette promenade à travers la Costière et la garrigue nimoise montrera plutôt que des sols proprement dits, à deux exceptions près, les formations superficielles sur lesquelles s'installent ou se sont installés les sols.

Il convient surtout d'en retenir :

- 1°- la variété de ces formations
- 2°- la dominance, dans le paysage, des formations rubéfiées
- 3°- la généralité, l'importance et la complexité du calcaire.

ce caractère

Paul MARCELIN
Conservateur du Musée d'Histoire
Naturelle de Nîmes,

Sont de la classe
Sont de la classe
Sont de la classe

Sont la route de
de l'épave (Pneumatique)

Sont les
Sont les
Sont les

En résumé, cette promenade
Sont les points de
à deux exceptions près, les formations
quelles s'installent ou se sont installées

Il en vient surtout d'un certain

- 1 - la variété de formations
- 2 - la diversité des conditions
- 3 - la variété des conditions

Soil profile sample No. 5

- A_p 0-7" Brown, friable, light clay loam. (pH is said to be 7.5.) I do not think this is overwash material. (Yellowish-red when dry.)
- A-B 7-11" Transitional. (Reddish-brown, when dry, clay loam.)
- B₂ 11-21" Dark reddish-brown clay loam. The soil has angular nut structure with some suggestion of prismatic. The coatings along the cracks are darker than the interiors of the aggregates. There are many small dark reddish-brown concretions. (Reddish-brown with dark reddish-brown spots, when dry.)
- B₃ 21-38" Dark brown, mottled with gray, clay. (Brown and very pale brown when dry.) Between hard massive and coarse blocky. There are spots that are nearly black. This horizon also contains many small dark reddish-brown concretions.
- C 38" + Massive crumbly, pinkish-white clay or clay loam(?) mottled with brown and white.

The roots go to the B₃ but not much below that.

This is a very important widely occurring soil in the region. On the higher terraces the material has been built up primarily from local alluvium.

Going on toward Lunel I see larger and smoother terraces developed from more general alluvium. These have almost solid grapes under clean cultivation.

We stop at the village of Vauvert on a low terrace and walk to the edge of the town and up a long hill to see the smooth, reddish, gravelly higher terrace. This is said to be of the older Pliocene. In a cut on the way up I notice

SAMPLE No.	HORIZON	DEPTH	pH	ORGANIC MATTER by H ₂ O ₂	SIZE CLASS AND DIAMETER OF PARTICLES (in mm.)							OTHER CLASSES (in mm.)			
					Fine gravel, 2-1	Coarse sand, 1-0.5	Medium sand, 0.5-0.25	Fine sand, 0.25-0.1	Very fine sand, 0.1-0.05	Silt, 0.05-0.002	Clay, <0.002	0.02-0.002	<0.005	>2	
No. 5															
S47France-5-1	A _p	0-7	7.7	1.4	0.9	1.5	1.6	5.2	14.4	53.4	23.0	17.1	26.4	1	
5-2	A-B (transitional)	7-11	7.7	0.3	0.3	0.7	0.8	3.3	11.0	44.6	39.3	17.2	43.3	<0.5	
5-3	B ₂	11-21	7.2	0.2	1.8	1.4	0.9	2.4	6.2	37.1	50.2	17.2	55.7	<0.5	
5-4	(Special sample - iron concretions)	Not run													
5-5	B ₃	21-38	8.0	0.2	2.9	4.7	2.7	4.2	6.0	42.0	37.5	23.6	44.0	43	
Thermal Analysis															
Peak temp.															
5-1	A _p	0-7	3.40			554°		20	%	23.0%	Hematite with a magnetic residue.	Hematite with a magnetic residue.			
5-2	A-B	7-11	.64												
5-3	B ₂	11-21	.49			545°		23	%	50.2%	Hematite with a magnetic residue.	Hematite with a magnetic residue.			
5-5	B ₃	21-38	.58			Associate of Terra Rossa on terrace									Just east of Montpellier,
5-6	C	38 +	.63												Southern France

Thermal Analysis
Peak temp.

Kaolinite

Clay

% Carbon



K-1276 May 6, 1947 France. Near Montpellier.
Grapes on reddish-brown soil of high terrace - the
dominant kind of agriculture. (Site of sample No. 5)



K-1277 May 6, 1947 France. Near Montpellier.
Grapes on reddish-brown soil of high terrace - the dominant
kind of agriculture.



K-1278 May 6, 1947 France. Near Montpellier.
Profile of long-cultivated reddish-brown soil on
high terrace. (Sample No. 5.)



K-1279 May 6, 1947 France. East of Montpellier.
Village of Vauvert from terrace, looking northwest.

interesting irregular contacts between the non-conforming old gray terrace material and the newer red material.

On the upland the soil in the field is a brown gravelly and cobbly loam, slightly grayish. The slope is about 1 percent. There are a few olives, but most of the cultivated land is in grapes. This soil is locally called terres grises. One of the French suggests that some wind-blown silt was mixed in with these gravels at some time during the formation.

We were shown only the road cut and had no opportunity to study the proper profile.

We return to the busses and go south. On the more general alluvium the soils are brown or grayish-brown and not so red as those represented by profile No. 5. As we go south from Vauvert the terrace gradually slopes to the sea. The soil becomes gravelly and grayish-brown in color. Most of the arable land is in grapes, but I see some olives and a little barley, oats, and hay. The hay is being cut now. People are out in the fields spraying the grapes. Many of the vineyards are very large and one sees some fine homes suggesting large estates or plantations. A great many pretty red poppies grow along the roads and in the few idle fields.

Apparently there is a great area of marsh land extending south to the sea. As we pass St. Andre west of St. Gilles there is more hay and pasture. Part of the grapes are grown along with olives. In some places the mixture is clean



K-1280 May 6, 1947
France. Near Vauvert. Sharp contrast of
irregular alluvial fills on old terrace. Gray
at right, red at left.



France. Near Vauvert. Kellogg, Henin (?), Cerighelli, Edelman, and Oudin. (Photo by Pendleton.)

cultivated and in other places there is a ground cover of barley or grass. We drive on through St. Gilles and go through an area of rather hilly shrub land with some goats. Near Bellegarde I see more sheep. They have their tails.

Northeast of Bellegarde we stop near a cut in a high gravelly reddish-brown terrace. The cover is sheep pasture. Reddish clay holds the gravel and small cobbles together comparatively firmly. There are accumulations some 2 feet thick of laminated loamy fine sand in the bushes on the left side of the road. I am told this is locally called "laparas et ligne blanche." This appears to be a fine sandy, loamy, loess-like material over a thin gravelly hardpan. I try to get a sample but find it quite difficult.

Soil sample No. 6

- | | | |
|-----|--------------|--|
| (1) | 0-8" | Yellowish-brown, mellow, very fine sandy loam. (Yellowish-red when dry.) |
| (2) | (8-15)-36" + | Red clay of a gravelly and cobbly hardpan. |

Some French think that this is not a genetic profile, but one due to some geological layering. Probably so. The soil is suitable for grapes, and is used for pasture.

The busses turn around and go a little way back toward Bellegarde and we stop by a field of alfalfa. The slope is about 2 percent. Although there is no erosion now there is a good erosion pavement on the surface.

Soil sample No. 6

	<u>Depth</u>	<u>pH</u>	
(1)	0-8"	7.9	
(2)	(8-15')-36"	8.0	(This sample has 20% kaolinite and may have some montmorillonite. The concretions contain a small amount of clay.)

ESSAI DE CLASSIFICATION DES DEPOTS SUPERFICIELS
DANS LES MONTAGNES CEVENOLES
LINGAS - AIGOUAL - CEVENNES - LOZERE
sur schistes métamorphiques et granites

I - FORMATIONS AUTRES QUE LES SOLS

1 - Dépôts par altération sur place des roches schisteuses et granitiques

Altération grise des schistes à séricité, un peu partout ;
Massif de l'Aigoual à Pueylong, à la Dauphine, etc ...

Altération rouge des schistes à biotite ; Vallées Cévenoles,
Vallée Française, Vieille morte.

Chaos de rochers granitiques des sommets - Aigoual, Lingas,
Lozère.

Arénisation cryptogène du granite; formation des boules - Pla-
teau de l'Espérou, route du Vigan - Mont Lozère.

Kaolinisation ; phénomènes éluviaux et illuviaux dans l'arène
Lingas.

2 - Dépôts dus aux remaniements par ruissellement -

Creeping - Déplacements colluviaux, comblement des vallées
préexistantes. Aigoual, partie haute des affluents de la Brèze; com-
blement des niches de nivation à Aires-de-Côte, route de Cabrillac.

Superposition de sols proprement dits - Lingas - Grandesque -
Haute - Ravin de Trépalous - Environs de la Sereyrède.

3 - Dépôts dus aux remaniements par glissement - (solifluction ?)

Faux sentiers de vaches et bourrelets - Sommet de l'Aigoual -
Espérou.

4 - Dépôts dus au remaniements par le vent -

Formation des sols d'humus alpin - Pelouse de l'Aigoual - Veil-
le Morte - Mt Lozère.

5 - Dépôts dus au remaniements par chutes et éboulements -

Eboulis, Amas détritiques - Chaës granitiques des torrents
(forêts des Oubrets)

Avalanches du sommet de l'Aigoual.

6 - Dépôts dus aux remaniements par entraînement alluvial -

Alluvions des torrents.

Terrasses étagées dans la vallée Française.

7 - Dépôts dus aux remaniements glaciaires -

Deux seuls dépôts morainiques incontestables : le Trépalous à
l'Aigoual, le cirque de Costeillades au Lozère.

THE
REPUBLIC OF THE
UNITED STATES OF AMERICA

DEPARTMENT OF THE
TREASURY
BUREAU OF THE
MINT

WASHINGTON, D. C.
JANUARY 1, 1900

TO THE
HONORABLE
COMMISSIONER OF THE
MINT

FROM
THE
DIRECTOR OF THE
MINT

SIR:

RE:

YOUR LETTER OF
JANUARY 1, 1900

IN REGARD TO
THE
MINT

YOUR LETTER OF
JANUARY 1, 1900

IS HEREBY
ACKNOWLEDGED

AND
THE
MINT

Niches de nivation d'Aires de Côte
Depressions fermées de petit diamètre
Modelé du plateau de l'Espérou.

En résumé - importance de phénomènes névéens ou périglaciaires ou subglaciaires d'âge indéterminé. Les formes et dépôts de ces montagnes résultent de la rencontre des phénomènes propres à la nivation et des phénomènes éluviaux et colluviaux. Le résultat est l'ensevelissement de la montagne sous ses débris dans les parties respectées par l'érosion remontante.

II - SOLS - (I)

I - Sols peu ou très peu évolués -

a) sols sur alluvions siliceuses ou calcaires, fond des vallées : supportant en général des prés. Vallées cévenoles.

b) sols squelettiques, grisâtres, poudreux, siliceux. Dans toutes les Cévennes sous la châtaigneraie, sous les landes à genêts et à bruyères.

2 - Sols ayant subi une notable évolution sur place -

a) Sols bruns évolués partiellement et superficiellement lessivés
type N. de la classification de l'Association Française pour l'étude
du sol - A1 - A2 - B - C

Dans l'Aubrac, sur basalte à 1240 m - p. H 5, 6 à 6,4

A la Pelucarie (Cévennes) sur schistes métamorphiques : Quercus
llex, Ericacées - p. H 6,2

Sol semblable dans la margeride, vers 1160 sol semblable passe
peut être à la série podsalique ; p. H 5,4.

b) Sol humifère de montagne - T3, A.C.

Pelouse de l'Aigoual et du Lozère, Cévennes ; Vieille Morte (2)
900 m, sur schistes métamorphiques ; quercus llex et Ericacées p.H-5

Palais du Roi, sur granites, 1438 m. Ericacées et Myrtilles, p H.4.4

Margeride 1490 m, même condition p. H 5.6

(Station préhistorique au col de l'Homme Mort, au Lingas, sous le
sol humifère).

c) Sols tourbeux

Paul MARCELIN

Conservateur du Musée d'Histoire Naturelle
de NIMES

(1) Echantillons recueillis par nous et étudiés par M. OUDIN

(2) Etudié à l'Aigoual et au Lozère avec M.M. BRAUN, BLANQUET, Dr. CABOUAT
et Max NEGRE.



K-1281 May 6, 1947
France. 3 kilimoeters from Bellegarde. A cut in
Brown Forest-Gray-Brown Podzolic soil from loess.
(Site of sample No. 8.)



K-1282 May 6, 1947
France. Near Callias. Deep road cut in loess

The surface is a yellowish-brown very fine sandy loam containing some stones. In depth the soil gradually becomes lighter. I take a Sample (No.7) at 5 feet of the light brown silty material, which is slightly compact and contains white micelle (calcium carbonate ?). If this is loess it is certainly very local or else most of the mantle has been removed.

Forty rods away is a large gravel pit. The soil has a grayish-brown surface, underlain by reddish-brown, heavy, gravelly clay. The clay is like that of the hardpan in sample No. 6.

About 3 kilometers northeast of Bellegarde we look at a cut in a soil part way between Brown Forest and Gray-Brown Podzolic from loess. The slope is about 1 percent.

Soil profile sample No. 8

- | | | |
|----------------|--------|--|
| A _p | 0-14" | Yellowish-brown silty very fine sandy loam. (Light brown when dry.) (Perhaps some accumulation near the roadside.) |
| B | 14-32" | Dark yellowish-brown silt loam. (Reddish-brown when dry.) The soil is generally massive with some tendency toward prismatic. |
| C | 32" + | Light yellowish-brown silt loam with many micelle. (Pink when dry.) |

Roots penetrate the whole soil deeply. (There are so many people here that it is almost impossible to see the soil, and then when one gets to the profile it is time to leave!) A little further on the soil is brown loam over gravel at 30 inches. It is imperfectly drained, and the surface material is

The surface is a yellowish-brown very fine sandy loam
containing some stones. In depth the soil gradually becomes
lighter. I take a sample (No. 7) at 2 feet of the light brown
silty material, which is slightly compact and contains white
micelles (calcium carbonate?). If this is loose it is certainly
very local or else most of the micelle has been removed.
Partly this may be a large gravel pit. The soil has a
grayish-brown surface, underlain by reddish-brown, heavy,
granular clay. The clay is like that of the horizon in sample
No. 6.

About 3 kilometers northwest of Bellegarde we look at a
cut in a soil part way between brown forest and gray-brown
Podsolite forest forest. The slope is about 1 percent.

Soil profile sample No. 8

A 0-15" Yellowish-brown silty very fine sandy loam.
(Light brown when dry.) (Porous some
accumulation near the surface.)

B 15-32" Dark yellowish-brown silty loam. (Sandy-
brown when dry.) The soil is generally
massive with some tendency toward granulation.

C 32" + Light yellowish-brown silty loam with gray
micelles. (Pink when dry.)

These penetrate the whole soil depth. (There are no roots
people here that it is almost impossible to see the soil, and
then when one gets to the profile it is time to leave.) A
little further on the soil is brown loam over gravel at 20
inches. It is apparently drained, and the surface material is

Gray-Brown Podzolic - Brown Forest transition 3 kilometers northeast of Bellegarde, Southern France

32a

SAMPLE No.	HORIZON	DEPTH	pH	ORGANIC MATTER by H ₂ O ₂	SIZE CLASS AND DIAMETER OF PARTICLES (in mm.)							OTHER CLASSES (in mm.)		
					Fine gravel, 2-1	Coarse sand, 1-0.5	Medium sand, 0.5-0.25	Fine sand, 0.25-0.1	Very fine sand, 0.1-0.05	Silt, 0.05-0.002	Clay, 0.002	0.02-0.002	<0.005	>2
S47France-8-1 8-2 8-3	A _p B C	Inches 0-14 14-32 32+	8.2 8.1 8.1	Pct. 0.8 0.2 0.1	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.
					1.4	2.4	2.6	12.6	29.2	39.2	12.6	9.3	14.6	2
					0.7	1.8	2.0	9.2	21.5	43.0	21.8	14.9	25.7	<0.5
					2.2	5.3	3.7	9.3	17.7	46.1	15.7	19.5	21.6	10
Gray-Brown Podzolic - Brown Forest transition - 3 kilometers northeast of Bellegarde, Southern France														

alluvium. There are now live oaks and shrubs. This has been called a wet phase of Brown Forest soil. Mostly it indicates carelessness in keeping the drains open and the brush cleaned out!

We arrive in Nîmes at 2:00 p.m. and get away early for the field at 4:15. East of Nîmes there are more olive trees, many of which are 100 and 200 years old, on high red terraces. We then pass into hills where the steeper slopes have only thin grass and shrubs. We pass Remoulins and go north to see Pont du Gard -- an old Roman bridge and aqueduct. Most of the soil is rolling Brown Forest. Here the farming is more mixed with some cereals, hay, and fruits, as well as grapes.

We stop at the village of Collias to look at a deep cut in loess. The walls at the top are conspicuously vertical and the trees growing along the side are very deeply rooted.

Soil sample No. 9 is a sample of this nearly white loess at 6 feet. In the lower part there are many carbonate concretions. This material is rather coarse silt with a good deal of very fine sand.

About 6:30 p.m. I take some pictures of the old Roman bridge at Pont du Gard. There is also an old saltpeter cave that was once used by prehistoric people. Some of their old ruins and artifacts are exposed. Most of the party go on a long walk through the park, but with only 4 hours sleep last night I am very tired and sit in the shade for awhile.

alfalfa. There are now live oaks and shrubs. This has been called a wet phase of brown forest soil. Mostly it indicates carelessness in keeping the brush open and the brush cleaned

out.

We arrive in Kansas at 2:00 p.m. and get away early for the field at 4:15. East of Kansas there are some olive trees, many of which are 100 and 200 years old, on high red terraces. We then pass into hills where the steep slopes have only thin grass and shrubs. We pass Herculina and go north to see Fort du Gurd - an old stone bridge and aqueduct. West of the hill is rolling brown forest. Here the farming is done almost with some cereals, hay, and fruit, as well as grapes. We stop at the village of Collins to look at a deep cut in loess. The walls of the cut are conspicuously varved and the strata growing along the sides are very deeply rooted. Roll terrace No. 1 is a sample of this nearly white loess as it lies. In the lower part there are many ornaments and crevices. This section is rather common all with a good deal of very fine sand.

About 5:30 p.m. I take some pictures of the old stone bridge at Fort du Gurd. There is also an old aqueduct here that was once used by prehistoric people. Some of their old ruins and artifacts are exposed. West of the party go on a long walk through the grass, but with only a few small trees. Night I am very tired and sit in the shade for while.

Demolon tells me I must make a speech tonight at dinner!

After a late dinner we have a still later meeting of a small group about the proposed conference in Paris to deal with the future of the International Society of Soil Science. Ogg alone objects to having the meeting, but he suggests no alternative that would get things going. He is much opposed to Hissink and doesn't like the idea of Hissink coming to the Paris meeting. Ogg also feels that FAO cannot help any in organizing a congress. It is all very discouraging and I go to bed.

May 7: Nîmes, Arles, and Marseille

We leave early on the road to Arles along a low terrace near the Petit Rhone. Here there is a good deal of cereal and pasture with perhaps less than one-half grapes. The soil is grayish-brown, nearly flat, and artificially drained. It looks something like the flat terraces of the Saginaw valley. About 5 kilometers west of Arles I see some rice patties, but just west of the city drainage is good, with crops of grapes, hay, and cereals. The Petit Rhone has very high levees lined with masonry. Between the river and the city are many vegetables and fruits in small fields.

I see some very bad bomb damage near the approach over the Rhone. Beyond Arles the principal crop is vines, despite imperfect drainage. A little ways further there is more barley and pasture, and the vines are poor. For some distance we

see patches of waste land and areas with hay and cereals, and then some areas with poor vines. Near la Porcelette I look at an area of Solonchak on typical alluvium of the Rhone. This soil is becoming more and more wet and salty, especially near the surface. There is very little micro-relief, although there are some bare spots. The vegetation is halophytic, including especially Salicornia.

Sample No. 10 special, is a grayish-brown clay loam (gray when dry), friable and now moist, with only a little suggestion of salt on the surface. I look at the soil in a prepared profile about 20 feet away.

Soil profile sample No. 10

- A₁ 0-6" Brownish-gray heavy silt loam. (Light medium gray when dry.)^{1/}
- B 6-20" Massive silty clay loam, mottled gray and brown; slight tendency toward prismatic structure. (Light gray when dry.)
- C 20" + Softer clay loam, mottled gray and rusty brown. (Gray when dry.)

We turn back northeast and a little before joining the main road southeast of Arles we see remnants of old red gravelly terraces mostly not used except for shrubby pasture. We stop on old gravelly deposits of Pliocene limestone, later covered with Pleistocene. Often these materials are indurated. Many have been covered by silt in recent irrigation. We see

^{1/} Added later: Note mottling practically disappears on drying.



K-1283 May 7, 1947
 France. Near la Porcellette, southeast of Arles.
 A view of Solonchak. Vegetation mainly Salicornia.
 (Site of sample No. 10.)

profiles in the cobbles and gravel. The red B is like the clay in sample No. 6. Beneath the B are grayish compacted cobbles and gravels. The surface yellowish-brown loam or very fine sandy loam, may be from more recent sediments. The stones in B and C effervesce with acid. The slope is about 1 to 2 percent. This is a poor soil and gives poor sheep pasture. (See No. 3 page 99 of the guide book.)

About a quarter of a mile away we look at a Wiesenboden in an imperfectly drained place in this terrace:

- A₁ 0-12" Dark gray heavy loam, rich in humus; well permeated with roots.
- A₁₁ 12-17" Like the above but lighter in color and has some gravel.
- G₁ 17-19" Yellowish sticky clay loam.
- C 19" + Grayish cobbles and gravel.

The vegetation consists of rather rank sedges.

Near Fontvieille we stop to look at an old Roman mill made largely from limestone. In some places on this structure there is a dark gray Rendzina soil.

Soil profile sample No. 11

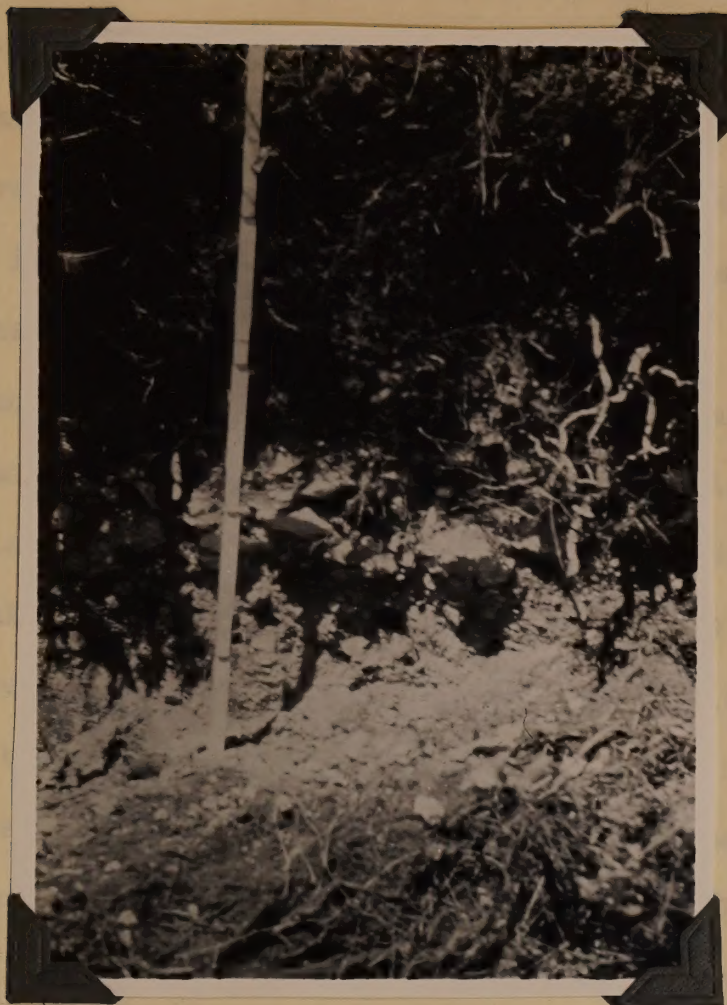
- A₁ 0-7" Brown loam speckled with gray.
- A₃ 7-12" Brownish-gray gravelly loam. (Light reddish-brown when dry.)
- C 12" + Gray limestone fragments.

We are always short of time. Apparently these trips were scheduled on what 2 men can do in a car. Over 100 in 3 or 4



K-1502 May 7, 1947
France. Near Fontvielle. Old Roman mill with some
thin Rendzina on it.

P-XVIIa



K-1503 May 7, 1947

France. Near Fontvielle. Lithosolic Rendzina on old
Roman mill. (Site of sample No. 11.)

busses and a half-dozen cars go more slowly. We have a grand lunch in Arles. Among other things Arles is supposed to be famous for its beautiful girls, and some of these scatter about among the foreign guests. In fact, one dressed in the native costume is seated next to me.

Again I have to make one of the "pretty" speeches. This is all very interesting but I am getting near the end of my resources in knowledge of the culture and traditions of the cities of southern France.

Lunch begins at 2, and we rise at 5, and immediately the excursion to Marseille begins. Just outside of Arles I see an old irrigation canal of masonry built in 1554. We go through a general farming country, irrigated for some 400 years. The crops are hay, cereals, vegetables, and some fruits. There is quite a bit of livestock. The farmers cut their hay with light mowers, stack it, and haul it to the barn on 2-wheeled carts. I see plowing with bullocks and some with one bullock and one horse as a team. I see no tractors. There are beautiful trees along the highway.

For several kilometers on the road to Salon we pass over a nearly level, extremely cobbly, Pliocene plain. Many of the cobbles have been gathered into small conical piles, probably to prevent landing of unfriendly airplanes. We pass the remains of an enormous American camp of World War II. The soils on this great plain are not used much.

Menu

Hors d'Oeuvre

Sole Meunière

Contrefilet à la Broche
Parmentier

Petits Pois Frais à la Française

Genoise

Le 7 Mai 1947.

A.M. & D. Kellogg U.S.A.:
La petite table d'honneur réclame
notamment l'annuelle traditionnelle que
vous nous avez promise jadis ici avec
une fidélité que nous comprenons et que nous
versons. — Nous nous engageons à vous
la réserver bientôt.

[Copie p. M. le Président

About 2 kilometers west of Salon I see some good hay and grain. A little maize is grown in gardens. Beyond Salon to the south there is hay, cereals, and small gardens on the grayish-brown soil of the terraces. And then we come to a large area of thin rocky hilly soils just north of Marseille. Much of this hilly land has abandoned stone terraces. There seems to be no Terra Rossa, although I saw some reddish soil just north of the city. A good many olives are grown along here. We pass two very large American camps with acres and acres of motorized equipment.

We arrive at the Hotel Splendid at 7:30, have dinner at 8:30, and go to a reception in the City Hall at 9:30. Finally I go to bed at 10:30 completely tired out.

May 8: Marseille - leave for Algiers

This promises to be a nice day. I walk along way with Aubert to the State Bank in order to get dollars changed into Algerian francs. The official rate here is only 117 francs to the dollar, whereas one can get twice as many on the street. It is quite a job to do a little business in a European bank. First, we must get dollars changed into French francs, and then go to another section of the bank to get these changed into Algerian francs. All this wastes a lot of time.



K-1284 May 8, 1947
France. Leaving Marseille for Algiers.



K-1285 May 8, 1947
France. Leaving Marseille for Algiers.



K-1286 May 8, 1947
France. Leaving Marseille for Algiers.

I look around a little in the book stores, then have lunch, and go down to the boat -- the Ville d'Oran. After much waiting and confusion, I finally go on board about 3 o'clock and am put in a small cabin with three others. I rest awhile, and then go on deck while we leave the harbor. During the afternoon I have a long discussion with Crowther of Rothamsted about our soil map published in the 1938 Yearbook. It seems he has been making an extensive mathematical study of the relation between climate and the distribution of the great soil groups. He is correlating the annual rainfall and the annual temperature of the first station in each county of those arranged alphabetically that have 20 year records, with the principal soil in the county. He is having a good bit of difficulty with the Prairie, Planosols, and Rendzinas. This is a very interesting exercise, and I think it may be helpful to us. I urge him to publish at least an abstract in Soil Science

I go to bed at 10:30.

Members of the Conference leaving Marseille May 8

Algeria - Chevalier, Roseau

Belgium - de Leenheer, Louis, Noirfalize, Smeyers

France - Demolon et Mme., Oudin, Lemoigne, Lefebvre,
Bordas, Rol, Joret, Depardon, Melle Garola,
Geslin, Chaminade, Franc de Ferriere et Mme.,
Dellenbach, Drouineau, Godard, Géze et Mme.,
Duffause, Aubert

Morocco - Grillot, Bryssine, Gaucher

Norway - Norghangen

Palestine - Reifenberg

Portugal - Bramao (sp.)

Sweden - Tamm

Switzerland - Palmann, Richard

Tunis - Yankovitch

United Kingdom - Ogg, Schofield, Russell, Jacks,
Muir, Crowther, Watt, Wallace

U.S.A. - Kellogg, Pendleton, Joffe et Mme.



K-1287 May 9, 1947
Algeria. Algiers. View from Fort near Casba.



K-1288 May 9, 1947
Algeria. Algiers. View looking toward Port over Casba.



K-1289 May 9, 1947
Algeria. Algiers. View of street in Casba.

May 2, 1917
Algeria. View of coast in center.



K-1290 May 9, 1947
Algeria. Algiers. View of street in Casba.



K-1291 May 9, 1947

Algeria. Algiers. View of part of inside
court of old Moorish harem, now used as home
of Catholic bishop.

May 10: In Algiers

I go out early and do a little shopping, and then to the opening session of the Conference at the University.

First there are the usual series of pretty speeches in French, but I can't help thinking how hungry I am after only "café complete."

Since many of the papers are included in the appendix and will be published in a special volume on the Conference I shall make no attempt to review them in detail in these notes. First we have a lecture by M. Barbut on the general physical setting of agriculture in Algeria. This is followed by an interesting paper by M. Berthault on the economic and social aspects of agriculture in Algeria. Some of the points he makes include the following:

Eighty-five percent of all Algerian exports are agricultural, but 60 percent of all Algerian exports are wines. He says that most of the vineyards are relatively small holdings of less than 100 hectares. (I wonder -- possibly "most" holdings, but he does not say most hectares!) These people market largely through cooperatives. New vineyards are being established now more slowly than before the war because of shortages of fertilizer and labor. There are only about 20,000 hectares of vines grown by the natives, but the amount is expanding.

① de Leenheer - d'Afrique Centrale, terr
(Belge) qui se régénère -
Killian - Les sols humifères et les asso
- tions végétales du Fouta Dj
Aubert. CONGRES DE PEDOLOGIE
L'érosion éolienne dans le N
du ALGERIE Sénégal

WAGONS-LITS // COOK
ALGER : 61, Rue d'Isly (en face
de la poste)
Tél- 330.12 - 332-14

ORAN : 8, Rue Alsace-Lorraine
Tél- 214.70

M R Kellogg

ITINERAIRE

G.A. N°10540

- VENDREDI 9 MAI : Arrivée des Congressistes par "Ville d'Oran"
Transfert en autocar à l'Hôtel ALETTI : Déjeuner;
A 15 heures : départ en autocar de l'Hôtel ALETTI
(côté mer) pour EL-BIAR (vue panoramique)
Visite à pied de la CASBAH
Dîner Logement à l'Hôtel ALETTI
- SAMEDI 10 MAI : Petit déjeuner - déjeuner - dîner - Logement hôtel
ALETTI
A 10 h. séance inaugurale : Salle GSELL aux facultés
Rue Michelet Angle Rue Edouard Cat, 100 mètres après
la Grande Poste
A 15 h. et 16 h. 30 : Conférences
à 6 h. 30 - 4 h. 30
- DIMANCHE 11 MAI : Petit déjeuner - Départ en autocar de l'Hôtel ALETTI
(côté mer) à 7 h. 30 précises pour la plaine de la
MITIDJA BLIDA : à 12 h. 30 déjeuner à l'hôtel d'Orléans
Excursion à CHREA - Retour à ALGER vers 19 h. dîner
logement à l'Hôtel ALETTI
- LUNDI 12 MAI : Petit déjeuner - déjeuner - dîner - logement à
l'Hôtel ALETTI
A 9 h. et 15 h. : conférences
- MARDI 13 MAI : Petit déjeuner - Départ en autocar de l'hôtel ALETTI
à 7 h. 30 précises pour le HAMIZ - EL ALIA - NADJEM
FONDOUK - LIN-TAY : à 12 h. 30 déjeuner à l'hôtel
TAMARIS
Départ à 14 h. 30 pour KOUBA - BIRKADEM - DRARIA -
SAOULA - STAOUELI - GUYOTVILLE - LE LITTORAL
Dîner et logement à l'hôtel ALETTI
- MERCREDI 14 MAI : Petit déjeuner - déjeuner - dîner logement à l'hôtel
ALETTI
A 9 h. conférence
A 14 h. 30 départ en autocar de l'hôtel ALETTI pour
MISON-VARREE (visite de l'Institut Agricole d'ALGER)
RIE et du Jardin d'Essai)

COMMUNICATIONS SECTION

RECEIVED

NOV 19 1944

14

COMMUNICATIONS SECTION

NOV 19 1944

TO: DIRECTOR, FBI
FROM: SAC, NEW YORK
SUBJECT: [Illegible]

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[Illegible text block]

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- VENDREDI 16 MAI : Petit déjeuner - Départ en autocar des hôtels à 6 h.30 pour les plaines du SIG et de PERREGUEUX
Déjeuner à SAINT-DENIS-DU-SIG (salle des fêtes)
Départ pour SIDI-BEL-ABBES et TLEMCEN
Dîner et logement à l'hôtel : *Transat Hautjoux*
- SAMEDI 17 MAI : Petit déjeuner - A 8h. départ des hôtels pour la visite de TLEMCEN et de SIDI-BOU-MEDINE
A 11 h.30 : déjeuner à l'hôtel : *Transat Hautjoux*
Départ en autocar à 12 h.30 pour EL-ARICH
dîner et logement à TLEMCEN à l'hôtel : *Transat Hautjoux*
- DIMANCHE 18 MAI : Petit déjeuner - A 8h. départ en autocar des hôtels pour NEDROMAH et NEMOURS - Déjeuner à NEMOURS hôtel : *de France*
A 14 h.30 départ pour PONT DE L'ISSER - INT-TEMOUCHENT et ORAN
dîner à : *Grand Hotel*
Logement à : *Grand Hotel*
- LUNDI 19 MAI : Petit déjeuner et logement à l'hôtel : *Grand Hotel*
Déjeuner et dîner à :
A 9 h. Synthèse des travaux du Congrès - Salle :
Maison du Colon Place Karguenta
Prière de passer à l'agence Wagons-Lits COOK,
8, Rue Alsace-Lorraine pour retirer votre billet
de passage définitif
A 15 h. conduite en autocar à la Santé Maritime
pour visite médicale (formalité obligatoire pour
être admis à embarquer) se munir du certificat de
vaccination anti-variolique - Départ des autocars
de l'agence WAGONS-LITS COOK : 8, Rue Alsace-
Lorraine
- MARDI 20 MAI : Petit déjeuner
Départ des autocars des hôtels à 7 h.30 transfert
au quai - Embarquement sur "VILLE D'ORAN"
Déjeuner - dîner à bord *Id*
- MERCREDI 21 MAI : Petit déjeuner - déjeuner à bord - Arrivée à
MARSEILLE à 17 h.
Fin de nos services.

RENSEIGNEMENTS UTILES

TABAC : La Douane tolère : pour les Messieurs : 1 Kg de tabac ou 100
cigares ou 500 ciga-
rettes
pour les Dames : 500 grammes de ciga-
rettes

RECOMMANDATIONS IMPORTANTES

Chaque passager est prié de remplir, en double exemplaires, la fiche individuelle d'identité qui nous sera nécessaire pour l'établissement du billet de passage définitif. LE BILLET PROVISoire dont vous êtes titulaire ne sera PAS ACCEPTÉ à l'embarquement.

Prière de le remettre en même temps que les fiches d'identité, soigneusement remplies, datées et signées, à notre agent au cours du voyage ALGER/RELIZANE par train spécial.

Veuillez passer à notre agence WAGONS-LITS COOK, 8 Rue Alsace-Lorraine le 19 MAI à partir de 14 h.30 pour retirer votre billet définitif de passage ORAN/MARSEILLE.

Les bagages voyageant sous la propre responsabilité des passagers, Messieurs les Congressistes sont priés de vouloir bien surveiller eux-mêmes les différentes manutentions.

N.B. - Messieurs les Congressistes sont priés de ne pas se démunir de leur carte d'adhérent qui leur a été délivrée par WAGONS-LITS // COOK et, pour facilitation du contrôle, de vouloir bien la présenter en échange des différents services qui leur seront fournis, notamment aux hôtels et restaurants. Des tables spéciales vous étant réservées, veuillez indiquer votre qualité de congressistes avant de passer à table.

Les vins fins, cafés, liqueurs ou autres extras n'étant pas compris, les suppléments s'y rapportant sont à régler directement aux hôtels ou restaurants par Messieurs les Congressistes les ayant commandés.

ASSOCIATION FRANCAISE POUR L'ETUDE DU SOL

CONFERENCE INTERNATIONALE
de
PEDOLOGIE MEDITERRANEE

ALGERIE 9 AU 20 MAI 1947

COMITE ALGERIEN de PATRONAGE

L'Embassadeur de France, Gouverneur Général de l'Algérie,
Le Secrétaire Général du Gouvernement Général,
Le Secrétaire Général Adjoint du Gouvernement Général pour les
Affaires Economiques,
Le Recteur de l'Académie d'Alger,
Le Doyen de la Faculté des Sciences d'Alger,
Le Directeur de l'Agriculture,
Le Président de la Société des Agriculteurs d'Algérie,
Le Président de la Chambre d'Agriculture d'ALGER,
" " " d'ORAN,
" " " de CONSTANTINE,
Le Président de la Région Economique d'Algérie,
Le Président de la Caisse Algérienne de Crédit Agricole Mutuel,
Le Président de la Caisse Centrale de Réassurance des Mutuelles
Agricoles de l'Afrique du Nord.

COMITE ALGERIEN D'ORGANISATION

MM: BARBUT, Inspecteur Général de l'Agriculture-Directeur
de l'Institut Agricole d'Algérie.
de BEAUCOUDRAY, Inspecteur Général des Forêts.
BERTHAULT, Membre de l'Académie de l'Agriculture.
BETIER, Inspecteur Général des Mines.
CHEVALIER, Chef du Service Agrologique.
LE DIRECTEUR, de l'OFFICE ALGERIEN D'ACTION ECONOMIQUE &
TOURISTIQUE.
DROUHIN, Directeur du Service de la Colonisation et
de l'Hydraulique.
DUCHE, Professeur à l'Ecole d'Agriculture de
SIDI-BEL-ABBES.
GAUCHER, Chef de Travaux à l'Institut Agricole d'Algérie.
GUNTZ, Professeur à la Faculté des Sciences d'ALGER.
HENRY, Ingénieur des Services Agricoles à TLEMSEN.
KILLIAN, Professeur à la Faculté des Sciences d'ALGER.
Dr. MAIRE, Professeur à la Faculté des Sciences-Président
de la Section Algérienne de l'Association Française
de la science du sol.
MONJAUZE, Conservateur des Eaux & Forêts à TLEMSEN.
ROSEAU, Professeur à l'Institut Agricole d'Algérie.
SACCARDY, Conservateur des Eaux & Forêts, Chef du Service
de la Restauration des sols.

A.- DELEGATIONS ENTRANGERES

GRANDE BRETAGNE

- W.G. OGG - Director. Experimental - Station Rothamsted -
Harpenden Herts Chef de délégation.
R.K. SCHOFIELD - Ph. Experimental Station Physics Département
Rothamsted.
E.W. RUSSEILL - Ph. Experimental Station Rothamsted.
C.V. JACKS - Director Experimental Station Rothamsted - Harpenden
Herts.
PROF. MUIR - Experimental Station Pédologie Département Rothamsted.
E.M. GROWTHER - Experimental Station Head of chemistry - Départ-
ment, Rothamsted Harpenden Herts.
PROF. Alex S. WATT - Botany school, University of Cambridge.
PROF. T. WALLACE - University of Bristol, Research Station - Long-
Aston.
A.B. STEWART - The Macaulay Institut for soil Rescarch- Aberdeen.
HARDY - Trinidad.

- BELGIQUE -

- PROF. J. BAYENS - Dr Station de Pédologie - University Catholique
LOUVAIN, Chef de Délégation.
PROF. L. de LEENHEER - Institut de Géologie et de Pédologie de
l'Université Agronomique de l'Etat à GAND.

- CANADA -

- PROF. Louis GOSSELIN - Institut Agricole d'OKA - Université de
Montréal - LA TRAPPE.

- NORVEGE -

- PROF. ROIF NORGHADEN - Professor of Botany and plant géographie -
OSLO.

- PALESTINE -

- Dr. A. REIFENBERG - Professeur à l'Université de JERUSALEM.

- PORTUGAL -

- M. BRAMAHO - Dr. de l'Institut des sols à LISBONNE.

- SUEDE -

- Dr. OLOF TAMM - Professeur de la Science du Sol à l'Ecole National
des Forêts près STOCKHOLM.

- SUISSE -

- Dr. HANS PALMANN - Directeur Agriculture - Chemisches Institut
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Station BELTSVILLE MARYLAND - Chef de Délégation.
J.S. JOFFE - Professor of Pédology - Agriculture Expériment- Sta-
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University.

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Dr. PRASSILOV - Membre de l'Académie des Sciences à MOSCOU. Chef
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Dr. POLYNOV - Membre de l'Académie des Sciences à MOSCOU.

- YOUgoslavie -

TRÉGUBOV

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Joseph LEFEBVRE - Professeur à l'Institut National Agronomique.
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KILLIAN, Professeur à la Faculté des Sciences d'ALGER.

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(Ecole Nationale d'Agriculture d'Alger)

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CHARLES, Chef de Travaux Laboratoire d'Agrogéologie.
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LIBOIS	Ingénieur des Services Agricoles.
MANGIN	Ingénieur des Services Agricoles.
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Wheat and barley are the most important cereals. In some parts freezing is a serious problem and in most places drought is a series hazard. Generally, the cereals are moving from the low plains. After wine, these cereal crops are most important. Hard wheat is an important native crop. A few years ago they produced 80 percent of the hard wheat, but now only about 65 percent. The French farmers generally get about 8.6 quintals^{1/} of wheat per hectare and the natives about 6.6. The French farmers get about 9 quintals of barley per hectare and the natives about 5. For 50 years the yields have been going up, especially among the French farmers. He says that now special help is given to the native farmers to help them improve their soil management and to encourage the use of better varieties. Fruits, including dates, olives, and oranges, and vegetables are of third importance. Tobacco is being grown in Bône. The production of oranges is increasing. Before the war Algeria had 6 million head of sheep, grown mostly by the Arabs. They still have very few cows.

He says that there^{are} about 9 million hectares in the Arab farm holdings, and $2\frac{1}{2}$ million hectares held by the French farmers. The French are concentrating on the low plains between the mountains and the sea. Formerly, this land was used little by the Arabs because it was too marshy. It was

^{1/} A quintal equals 100 kilograms.

drained by the French and is now the most productive land in the country. He spoke of new efforts by SAR (Secteur d'Amelioration Rurale) to demonstrate on the larger holdings how natives may improve their agriculture. Each of these demonstrations has 300 hectares in the fruit-growing areas, and over 1,000 hectares in the grain-growing regions. Many native families are placed on each holding.

I go to lunch; have a short rest; and then back to the sessions.

Jacks, of the Imperial Bureau of Soils, gives a general talk on the "principles of human ecology in relation to soil." He points out that the tenant system in England and western Europe led to soil conservation, whereas the tenant system in the United States stimulated erosion. Of course, this is ridiculous without taking into account, as he did not, the entirely different types of tenancy!

Walter Russell gives a good summary of the important points about cultivation. New problems have arisen with the replacement of horses, bullocks, and mules with tractors. There are many new problems in the tropics where often crops are being cultivated for the first time. He says that the great function of the moldboard plow is to kill weeds. If the land is free from weeds one may use other types of cultivators. He thinks the plow is necessary in England. Of course, he recognizes that the plow is not used to amount to anything in

the eastern Mediterranean. He says a bit about how deep to plow. Many farmers in England plow 30 to 50 centimeters, whereas most experiment stations in England, the United States, and Sweden, have not shown much benefit from plowing more than 15 centimeters. He says that deep plowing does loosen the soil more by breaking up any hardpan, and it improves drainage. Deep plowing controls the weeds better. It mixes fertilizer and lime in a deeper layer of soil. He says that there is no evidence at Rothamsted that mulch from cultivation has any value.

Where rains are hard, cultivation does not seem to encourage the entrance of water, but probably it does with flood irrigation.

He summarizes the present position on the stubble mulch. He emphasizes properly that in the tropics one cannot leave the soil bare for very long, so that in the humid tropics one must depend upon biological-ecological methods for weed control rather than upon tillage methods.

M. de Leenher reads a paper on "The regeneration of the land in Central Africa." He takes exception to the statements made by Harroy in his book, Afrique: terre qui meurt.^{1/}

Aubert discusses the soils of Senegal, stressing the degradation of the soil by the sorting action of wind which removes the fine material.

^{1/} See Congo Journal June 8.



K-1292 May 11, 1947
Algeria. South of Blida. Terraces rather poor in
highlands.



K-1293 May 11, 1947. Algeria. South of Blida.
Terraces on eroded soil from schist. Figs, olives,
caroubier (a legume), and almonds are planted by forest
service people just behind terraces as part of erosion
control scheme.

At 6 o'clock we go to a reception at the residence of the Governor General of Algeria. The residence is a beautiful old Moorish home and garden on a high hill overlooking Algiers. Swarthy sentinels in old Moorish uniforms guard the dark doorways. Here I meet the American Consul-General and his wife -- Mr. and Mrs. Finley. He is a big man, and in most ways a typical American business man and Rotarian. Much as I usually dislike receptions I find this one very pleasant.

Then we go back to the hotel for dinner at 8 p.m. I steal an orange for my breakfast and go to bed.

May 11: Field trip to Blida

We are up early for the bus and a trip to Boufairk and Blida. It is cloudy and threatens rain. While we are waiting in the bus for the others a parade of native troops and marines go by as a part of V.E. day anniversary celebration. Our route takes us along the dock area for quite a distance. It is mostly well kept and clean. On the dock there are simply thousands of huge wine barrels. Beyond the dock area I see many beautiful terraced gardens and orchards. On the steep escarpment bordering the narrow coastal strip through the city, the surface soil is reddish-brown. The deep cuts suggest mostly yellowish sandstone with other sedimentaries. As in southern France we see many men and boys playing at bowls with

CONFERENCE INTERNATIONALE DE PEDOLOGIE MEDITERRANEENNE

ALGER (10 - 14 Mai 1947)

Programme des Conférences et Communications
(Salle GSELL - Université)

- Samedi 10 Mai - 10 heures - séance inaugurale sous la présidence de Monsieur l'Ambassadeur de France, Gouverneur Général de l'Algérie.
Conférence de MM. P. BERTHAULT et BARBUT - l'Algérie Agricole.
14 H. 30 - sous la Présidence de M. L'inspecteur général BARBUT
Communications de :
Belge M. JACKS - Erosion des sols.
Belge M. ROSEAU - Circulation de l'eau dans le sol.
Belge M. RUSSELL - The function of soil cultivation with particular référence to erosion contrôl
16 H. 30 - sous la présidence de M. KELLOGG, *Belge* chef du Bureau des sols des Etats-Unis, communications de :
M. de LEENHEER - (Note de MEULENBERGH) - L'Afrique Centrale, terre qui se régénère. *étude in Guinée française*
MM. KILIAN *Belge* et SCHNELL - Observations sur les formations végétales et les sols humifères correspondants des Monts BOUNA et du FOUTA-DJALON.
M. AUBERT - L'érosion éolienne dans le Nord du Sénégal.
- Lundi 12 Mai - 9 heures - sous la présidence de M. le Dr MAIRE, membre de l'Institut,
Conférence de M. SACCARDY : La Forêt et le sol.
Communication de :
M. KILIAN - Pédobioologie des terrains des environs d'Alger.
M. FAUREL - La Cedraie de l'Atlas de Blida, ses sols, ses Associations végétales.
M. KILIAN - Conditions édaphiques chez les plantes des pâturages steppiques algériens.
14 H. 30 - sous la présidence de M. le Dr REIFENBERG professeur à l'Université de Jérusalem (Palestine) *Les méthodes d'étude des Terrains*
Conférence de M. GAUCHER - ~~Pédologie et irrigation en Algérie~~ *salins*
16 heures - sous la présidence de M. CROWTHER chef des Laboratoires de Chimie à la Station Expérimentale de Rothamsted (Angleterre)
Communication de :
M. YANKOVITCH - Etude sur la résistance de certaines cultures d'été aux chlorures.
MM. ROSEAU et BATS - Analyse physique des sols calcaires.
MM. GRILLOT et BRYSSINE - Contribution à l'étude de l'humidité des sols du Maroc.

.../...

Mercredi 14 Mai - 9 heures - sous la présidence de M. le Professeur NORDHAGEN
 Directeur du Jardin Botanique et du musée d'Oslo
 (Norvège) - Communication de :

- M. DEL VILLAR - Les sols de l'Afrique du Nord
- M. YANKOVITCH - Carte schématique des types de sols, de Tunisie
- M. MIEGE - Les études pédologiques au Maroc.
- M. GAUCHER - ~~Méthode d'études des terrains salés en Afrique du Nord.~~ *Les Sols rouges en Algérie.*

II heures - sous la présidence de M. BRAHMO, Directeur de
 l'Institut des sols à Lisbonne.

Communication de :

- M. BRYSSINE - Contribution à l'étude des sols de l'Extrême
 Sud Marocain. *(Carnot 1907)*
- M. GEZE - Paléosols et tendance évolutive actuelle.
- M. AUBERT - Sols du Sénégal.

*Shous a rally
 semi-étendu
 géologique map*

*Compensation
 Receipt in thousands*

*Did they make any new
 arrangements about travel,
 etc.*

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metal balls a little larger than baseballs.

As we go over the escarpment I see citrus, almonds, peaches, quince, olives, grapes, and other fruits, as well as ornamentals. Some of these plants serve also as windbreaks.

The soil is a pronounced red. There is some significant erosion on the slopes but generally, this is controlled by terraces and plantings. The soil is said to be from marine deposits of the upper Miocene. Most of it is quite rolling. Beyond Birkadem some cereals appear. Part of the soil is yellowish and reddish-brown. There are a good many grapes and here they are not pruned quite so severely as around Arles. Along the road we meet a great many loads of green, freshly cut hay.

But as we go on, the land is mainly devoted to wine grapes, although part of the fields are in fallow, and I see some fruits and vegetables. Near Bir-Toute there is reddish-brown very gently undulating soil from deposits of Quaternary age. Just beyond there are occasional windbreaks of trees and many made from canes. On the whole, the fields of barley and oats look poor. There is some irrigated citrus but the larger part of the area is solidly in wine grapes. Along the road here are many nice homes with beautiful gardens.

A little ways southwest of Bir-Toute the soil is not so red, but more grayish-brown. I see some irrigated maize, potatoes, and other vegetables. After les 4 Chemins the soil is nearly



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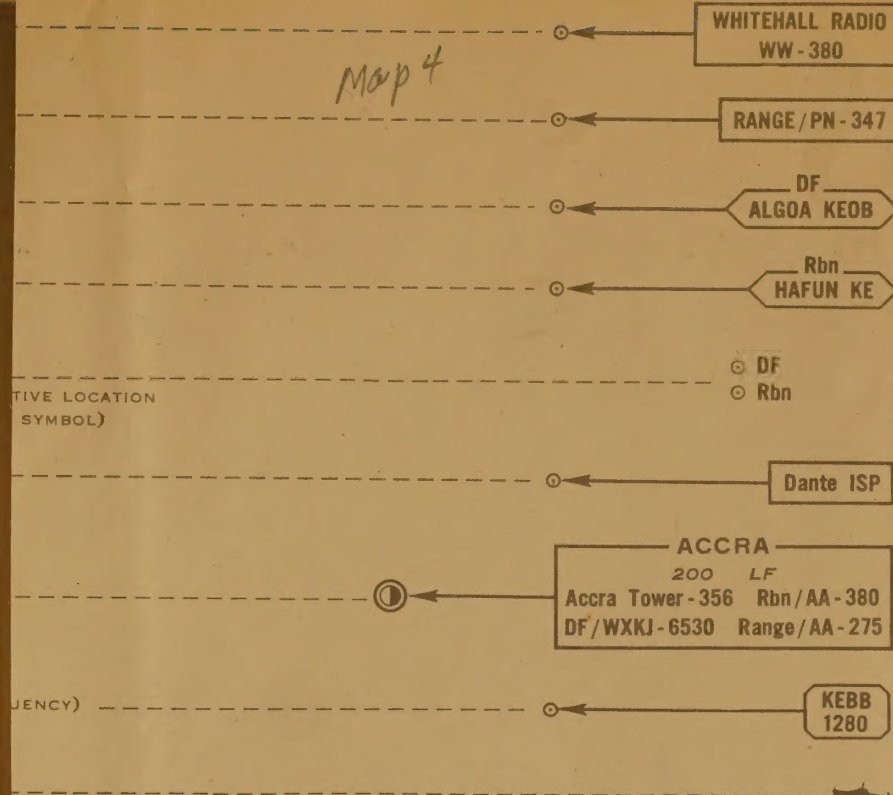
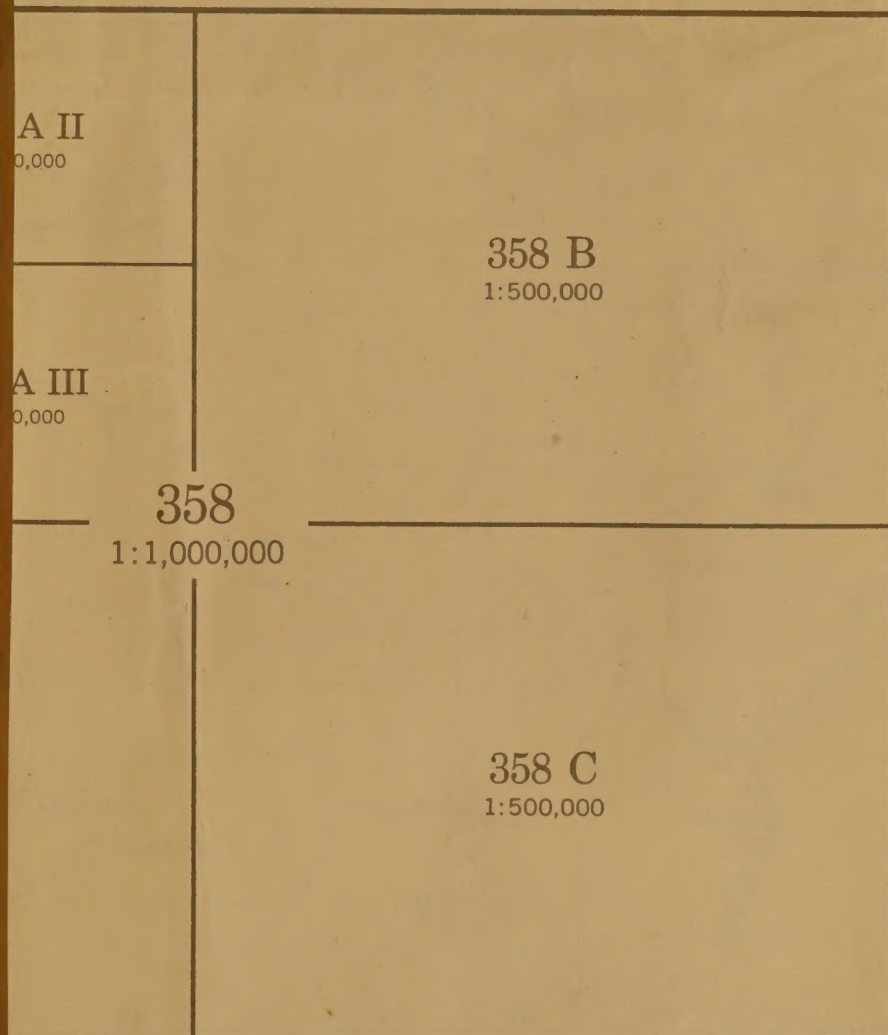
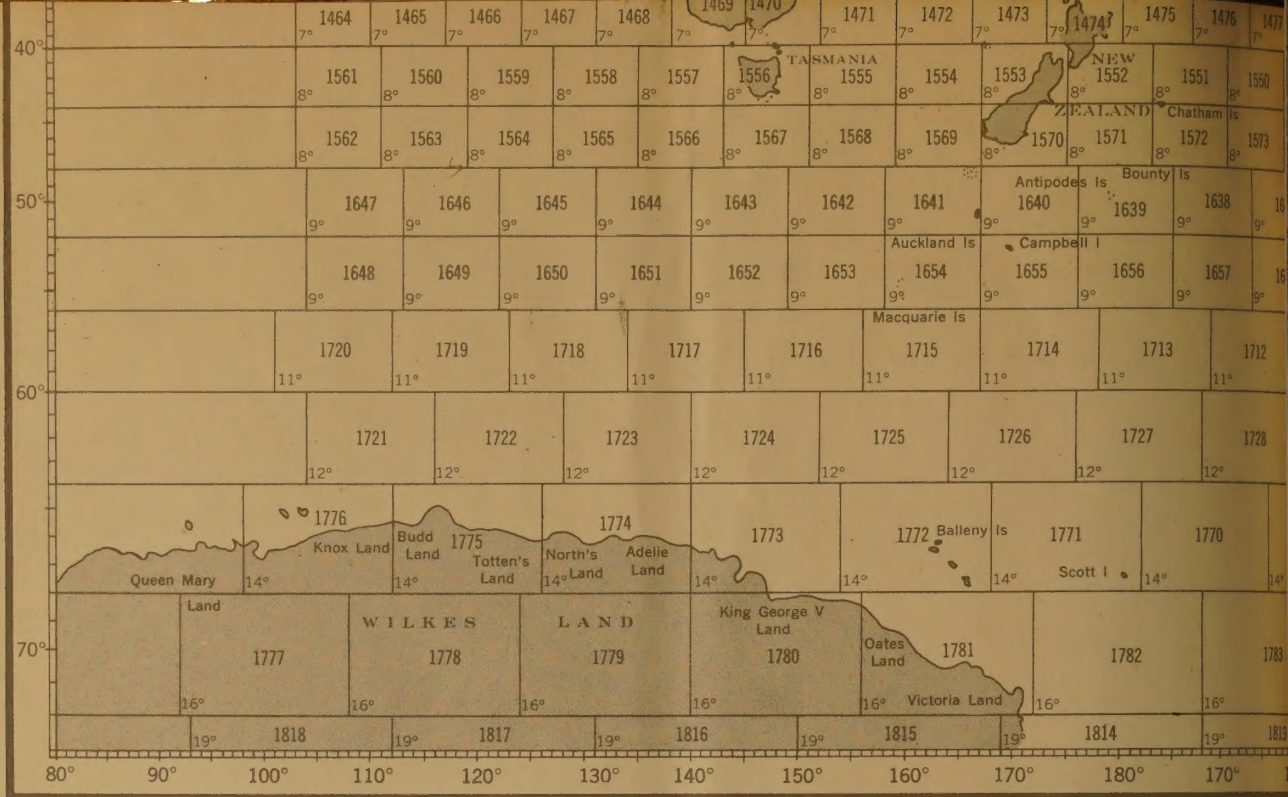


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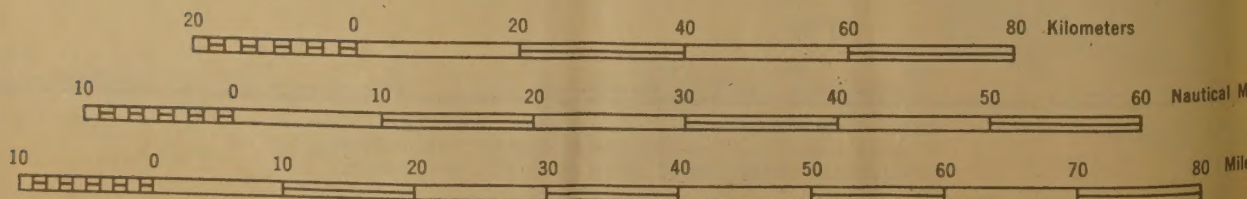
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level, and imperfectly drained. The principal crops -- hay, pasture, and cereals -- look rather poor. At least some of the oats are cut green for hay. Part of this is cured in cocks, and part is fed green and fresh to livestock. The smooth plain continues. There are some fruits and grapes on the higher swells. Apparently they are not well adapted to this soil. We see very few animals. Likely the forage is used for work animals. I see a few white, gray, brown, and black sheep. We descend from the busses at Boufairk. This town has many nice small parks and private gardens. Originally the great plain in which this city is located was swamp and infested with malaria. The early French settlers drained it and established farms. In the city is a large memorial to these early French, many of whom died of malaria. Just beyond this little city is a large area of wine grapes being cultivated with a tractor. Beyond the grapes are large areas of barley, oats, hay, and some wheat. All the cereals seem to be short. Quite a bit of the barley is very dark green in color-- in fact, looks almost black. It has very heavy beards. A large part of the oats is being cured for hay.

As we drive on to the southwest, beautiful mountain slopes come into view to the south. We pass through Beni Mened, still on the smooth artificially drained plain with grayish-brown soil. Even here are some wine grapes, but cereals predominate, especially the "black" barley. I see a few more sheep and

level, and landscape around. The principal crops -- hay,
wheat, and cereals -- look rather poor. At least some of
the best and best grown for hay. Part of this is cut in
cows, and sent to the feed house at Minsk. The
small grain consists of oats and some little and grows on
the higher hills. Apparently they are not well adapted to
this soil. We see very few animals. I think the range is used
for work animals. I see a few white, grey, brown, and black
sheep. We descend from the heights of Minsk. This town has
very nice small houses and private houses. Originally the
great plain in which this city is located was swampy and in-
habited by the early French settlers. The early French settlers
and established farms. In this city is a large amount of
these early French, many of whom died of malaria. They regard
this little city as a large area of what was once swampy and in-
habited with a forest. The land was given to large areas of land
and some wheat. All the cereals seem to be
short. Only a bit of the grain is what grows in other
in fact, looks almost black. It is very heavy bread. A large
part of the city is being given for a
as we drive on to the south west, beautiful mountain ranges
come into view to the south. The great range of hills, still
on the smooth artificially drained plain with grassy-brown
hills. Even here are some wine grapes, but cereals predominate.
Specially the blackberry. I see a few more sheep and

goats. Olive trees are on either side of the road. As we approach the mountains I see more vines and olives, with cereals underneath. There is a gorgeous natural pattern of fields and orchards on the mountain slopes to the left. Up to now we have seen mostly French, but here are quite a few Arabs.

We come into Blida, which has many beautiful private gardens and houses along the street. We stop near a typical "Esso" station for a few moments, which looks like many street corners in the United States. We descend from the bus and walk across the river to take military trucks up the winding mountain road.

At first, we see little Arab farms with goats on thin pasture, and many kinds of crops. The higher slopes are badly eroded. The geologists dispute about the rock formations -- some say they are Permian and others maintain they are Cretaceous. I look at some terraces on the eroded soil and the rock seems to be a sort of metamorphosed phyllite, which the French call schist. We stop on one of the bold hills for a discussion of reforestation for erosion control. The Forest Service of Algeria has constructed terraces and planted fruit trees and some other trees in the terraces. Here I see figs, olives, almonds, and caroubier (a legume). 1/

1/ This produces beans fed to cattle and horses.



K-1294 May 11, 1947
Algeria. South of Blida. Closer view of trees planted
behind terraces.



K-1296 May 11, 1947
Algeria. South of Blida. View from terraced slopes,
looking toward Blida and great plain in the distance.
At right, old type of reforestation.

These terraces are on slopes from 7 to 70 percent, and on the whole the work seems to have been well done. Aside from trees the wild land has a thin cover of grass and small herbs. We go up further toward the mountains. This country was originally forest. The forest was removed for cultivation and grazing by the natives. There has been a good deal of erosion. Samples of the surface soil contain an average of about 63 percent gravel. This erosion is becoming dangerous for the city of Blida, since it is built on a delta from a mountain stream.

The terraces for the trees are built at a slight angle to the contour, to encourage the entrance of water to the soil from rain and melting snow. The rainfall is only 900 millimeters but very irregular so that any terraces must be built to withstand very heavy showers. They tell me that it is not practicable to terrace very stony soils. I think this is the steepest land I have seen terraced in this way.

According to our guides the population is very cordial to this work. In this project people are required to sell their sheep and goats, but they may keep some cattle. The trees are planted during the winter months when the soil is highest in moisture. The terraces are maintained by the Forest Service for 2 years and then turned over to the local people. There is said to be a great variation among the natives in their acceptance of this sort of work. I'm told



K-1297 May 11, 1947
Algeria. South of Blida. Very hilly land where terracing
is being undertaken.



K-1298 May 11, 1947
Algeria. South of Blida. Terraces well made on about
70 to 80 percent slope.



K-1299 May 11, 1947
 Algeria. South of Blida. Close view of steep
 slopes, partly cultivated with terraces.

that the Kabyle people here like trees more than the true Arabs.

We return to Blida about 1 o'clock for lunch. As usual we have a very heavy lunch with much wine. But since there were only two pretty speeches we are through in two hours! Now it is again cloudy and looks like rain.

From Blida we drive to the southeast, again in the hills, to Charea. Just outside the city on this road we see olives, figs, and other fruits, with vegetables or cereals underneath. Agave is used some for erosion control as well as a cactus that looks something like our prickly pear but with fewer spines. We go up another steep winding road; and the higher we go the more evidence we see of erosion. There is serious sheet erosion and many gullies. We stop to watch a demonstration of terrace construction with machines on this eroded land. The rock material is said to be schist, like that we saw earlier, but I think this is better soil. The rock contains more basic material. It is probably a Brown Forest soil. This eroded land is generally very steep and rugged. I see more terraces with the fruit trees on slopes up to nearly 100 percent.

We stop at a slope that has been stabilized with eucalyptus trees, and in the road cuts we can see that the soil is a rather weak Brown Forest on bedded colluvium. This area has



K-1300 May 11, 1947
Algeria. South of Blida. At work on terrace.



K-1301 May 11, 1947
Algeria. South of Blida. Terrace nearly finished.

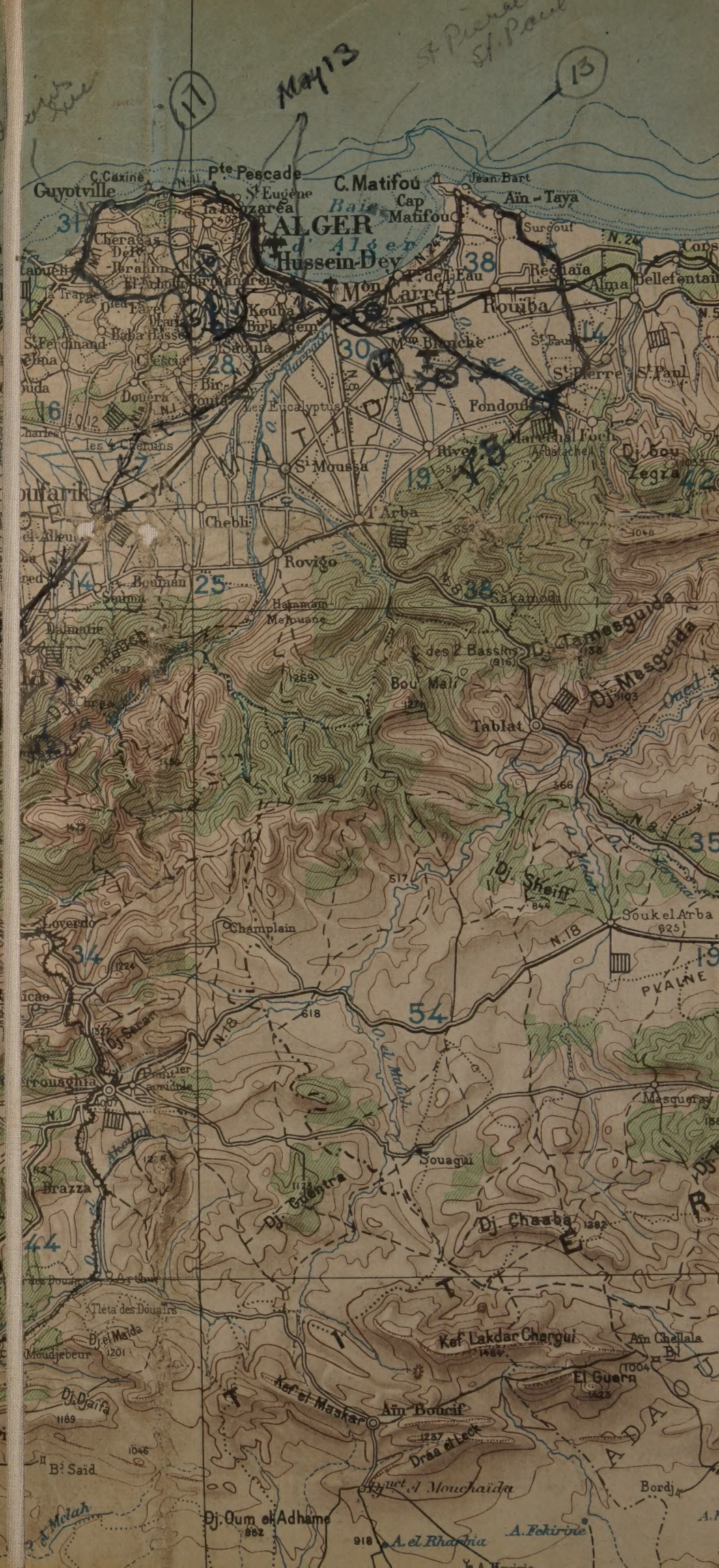
been in forest for 25 years following a period when it was nearly barren. We get out here and look at the soil. (For some reason there are a few French women and children along on this trip and certainly it is no place for them.) In addition to the eucalyptus there are small oaks, locusts, pine (Pinus halepensis), and others. As we walk up the grade we find ourselves in fog. Here there is more ground cover, including a wide mixture of ferns, wild roses, aromatic shrubs, etc. As we walk up the slope we see some cedars (Atlantica) and chestnuts.

I decide to take a sample of this Brown Forest soil from metamorphosed phyllite, although it will hardly be worth the trouble. First of all, there is an overwash of dark brown gravelly very fine sandy loam (brown when dry) about 28 inches thick.

Soil profile sample No. 12

A ₁	0-13"	Very dark brown very fine sandy loam; soft fine granular; many angular rock fragments. (Dark medium brown when dry.)
A ₃	13-28"	Brownish-gray loam, angular gravel. (Pinkish-gray when dry.)
C-D	28" +	Gray phyllite.

The soil has about 15 percent slope but the surface is quite irregular. The land is now stabilized but has been eroded and filled in the past.





K-1302 May 11, 1947
 Algeria. In mountains south of Blida. View of
 forest about 25 years old. Made up of eucalyptus
 with some oaks, locust, pines (Pinus halepensis),
 and others.

We are now about $12\frac{1}{2}$ kilometers from Blida in a thick fog, and it is 5 p.m. We shall be very late indeed; even so, the party needs to stop in Blida for a little while to seek "refreshments." The city square is full of a gay crowd. Most are French but there is a large sprinkling of Arabs. Here the Arab women cover all the face except for one eye. I understand there is to be a grand ball tonight in celebration of Victory Day. Of course, darkness comes on the way back to Algiers. The trip reminds me some of going across to California from east to west: first the high mountains, then the plain, and the ridge near the coast. Today I have seen only one good field of barley. Most of the cereals here are poor and will run about 4 to 12 bushels to the acre.

Again today we have spent most of our time on the forest soils. In this conference our field trips have been arranged mostly by the foresters and ecologists who have little interest in long cultivated soils, especially those in the alluvial plains; although these are, of course, of greatest importance to the agriculture of both southern France and Algeria.

I get dinner as soon as possible and go to bed at once.

May 12: In Algeria

Again we have a cloudy day. I go to the sessions at the University which are scheduled to begin at 9 o'clock. As usual, the people are slow in assembling. Here it is the custom each morning for everybody to shake hands all the way around. This wastes a lot of time.

This meeting room at the University has extremely poor acoustics. I can barely understand the material presented in English, a little less of what the Belgians say in French, and hardly anything of what the French speakers say. At least for my ears, the Belgians enunciate more clearly. Fortunately, this morning we do not have so many "gate-crashers" as yesterday and the day before.

Besides the poor acoustics we have the continual roar of busses, street cars, and trucks. It certainly makes one tired to be on such nervous edge trying to listen under such conditions.

M. Saccardy discusses "soil phytobiology" as related to the forest soils in Algeria. He describes climate and physiography, which have already been shown clearly on the wall maps. He emphasizes the importance of the dry summers and the humid winters, and the great importance of water conservation. He proposes that a soil map will follow the rainfall very closely in Algeria -- as does the vegetation. (But obviously he is concerning himself only with the natural soils

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TRAVAUX RÉCENTS

SUR LES SOLS AFRICAINS



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Laboratoire d'Agronomie Coloniale. Paris.
22^e Année, 1942, N° 254 - 255 - 256
(Oct. - Nov. - Déc.), pages 495 à 500.

Travaux récents sur les Sols Africains^(*)

La mise en valeur des territoires coloniaux et, en particulier, des territoires tropicaux a donné lieu ces dernières années à de nombreuses études ; la connaissance des sols tropicaux de notre Empire s'en est trouvée très accrue. Aussi bien au point de vue du climat que de la végétation, ces contrées doivent être subdivisées en deux zones très distinctes : zone tropicale humide et zone tropicale sèche. Dans ces deux zones les sols sont, eux aussi, très différents.

Les régions tropicales humides sont le domaine de la grande forêt et de la latérite (1). Le climat sous lequel celle-ci se forme comporte, à côté de saisons de pluies aux précipitations très abondantes et très violentes, des saisons sèches nettement marquées où le lessivage des horizons supérieurs est arrêté ; parfois, même, les solutions du sol subissent alors un mouvement ascendant qui ramène en surface les éléments basiques. Dans ces périodes, les oxydes de fer et d'alumine — éléments latéritiques — laissés en place lors de la première phase (phase alcaline) d'altération des roches ou remontés de l'horizon inférieur, sont desséchés et pectisés. Ils ne peuvent plus, ensuite, être redispersés. Ainsi prend naissance la cuirasse latéritique, souvent si développée. Elle se forme en profondeur sous forêt. Lors de la disparition de la forêt, elle durcit et peut apparaître en surface, le sol n'étant plus protégé contre l'érosion.

Si la saison sèche est de moins longue durée, ou moins marquée, le sol n'est plus une véritable allite, comme la latérite, il peut être classé parmi les siallites allitiques : c'est une argile rouge latéritique. A l'extrême, dans les régions équatoriales sans saison sèche, sous la grande forêt ombrophile où l'humidité est constante, il se

(*) Les travaux qui sont analysés dans cette note sont ceux qui ont pu nous parvenir depuis dix-huit mois et qui n'avaient pu être inclus — soit qu'ils aient paru depuis son impression, soit que par suite des circonstances actuelles nous n'ayons pu nous les procurer auparavant — dans notre précédente publication : Les Sols de la France d'Outre-Mer (Monographie publiée par les Stations et Laboratoires de Recherches agronomiques, Imp. Nat., Paris, 1941)

Les chiffres entre parenthèses renvoient aux ouvrages cités dans la bibliographie adjointe à ces quelques notes.

forme une siallite de néosynthèse : l'argile rouge. Assez souvent, sous l'effet d'une humidité excessive, sa surface se podzolise, le fer étant entraîné en profondeur ; ce sont alors les terres grises.

Si, au contraire, le caractère humide s'atténue, soit par augmentation de la saison sèche, soit par diminution des chutes totales de pluie, naissent les sols latéritiques, souvent appelés terres latéritiques : terres rouges, terres noires, terres jaunes latéritiques.

Si le climat ne comporte plus une humidité suffisante pour permettre le développement de la forêt, la savane prend sa place et le sol devient encore une terre rouge mais de caractère latéritique moins prononcé, généralement très perméable, tandis que les argiles rouges des régions équatoriales le sont, au contraire, très peu.

Ce passage de la zone des savanes à celle de la forêt-galerie, puis de la forêt dense et enfin de la forêt ombrophile est, dans ses grandes lignes, un phénomène nettement climatique (2). La savane à **Acacia**, et plus au sud à **Borassus flabelliformis** correspond à des chutes de pluie de 800 à 1200 m/m. Elle se trouve presque confinée au nord du 10° parallèle. La forêt-galerie commence le long des cours d'eau vers le 10° parallèle ; la forêt d'arbres à feuilles caduques descend jusqu'au 8° parallèle ; au sud du 8° s'étend la forêt ombrophile. Entre les 5° et 7° méridiens Est, cette limite des zones de végétation ne reste pas parallèle à la côte, elle s'incurve un peu vers le Sud, mais elle est toujours déterminée par des variations dans le caractère du climat. La savane peut naître aussi du fait de l'homme, à la suite de défrichements intensifs ou d'incendies répétés de la forêt. Il semble, par ailleurs, qu'elle puisse, dans certains cas, être due à l'établissements de la nappe phréatique à un niveau trop proche de la surface.

Dans les sols de savane l'humification est très mauvaise ; dans les sols de forêt la matière organique est aussitôt oxydée et brûlée que déposée : les éléments qui résistent sous d'autres climats — lignine, par exemple — sont eux aussi attaqués. Tous ces sols sont très appauvris en éléments assimilables ; cependant, ils portent souvent, au moins les sols de forêt, une végétation exubérante qui ne peut s'expliquer que par suite de conditions physiques du sol très favorables et d'un climat très chaud et très humide provoquant une altération très rapide des roches. Quant aux microorganismes, nombreux et actifs, même en sol sec de savane, ils présentent un maximum d'activité à profondeur moyenne. Ils sont très sensibles aux variations d'humidité et d'aération. En particulier, ils sont très réduits sur les sols de « poto-poto », très peu aérés.

Dans les régions tropicales sèches peuvent encore s'observer des terrasses. Elles ne sont pas dues à l'action du climat actuel : elles sont anciennes (3). Il semble en particulier que les terrasses latéritiques de la région de Gao-Bilakalo, sur les bords du Niger, constituées au cours du deuxième pluvial quaternaire, aient subi les processus de décalcification pendant la fin de l'interpluvial qui lui a succédé, puis pendant le pluvial suivant et jusqu'à la fin du Néolithique. Les preuves qu'on en peut donner ne sont cependant pas absolues ; il s'agit là d'hypothèses de travail que de faits réellement certains.

Dans la zone d'épandage du Niger, à côté de sols argilo-calcaires, riches, s'observent des sols décalcifiés beaucoup plus pauvres, heureusement peu développés. Dans ces sols tropicaux secs, dépourvus de matière organique, la teneur en eau croît en général avec la profondeur. Malgré leur grande sécheresse ils sont riches en microorganismes qui paraissent peu sensibles à la teneur en eau de leur milieu de vie. Par contre, ils le sont toujours beaucoup plus à son aération (4).

Beaucoup de ces sols sont attaqués par l'érosion, c'est là un phénomène aussi important au point de vue théorique que pratique : dans les pays à climat chaud, les sols érodés sont en effet moins nombreux que les sols au profil entier (5). L'érosion dépend d'un grand nombre de facteurs : climat atmosphérique et climat du sol, type géologique et propriétés des sols, topographie, végétation, etc. La couverture végétale est le meilleur moyen de lutte contre cet empiètement des terres, aussi ne faut-il laisser la terre à nu que si les autres facteurs ne provoquent pas une exagération des phénomènes érosifs ; en particulier, il faut éviter de cultiver les pentes trop fortes, et sur les pentes moyennes il faut employer des méthodes culturales adaptées : culture en bandes de niveau différentes, les unes laissant le sol presque nu, les autres le couvrant beaucoup plus ; clôtures en terrasses, murettes de pierres, etc. Il est important aussi d'améliorer la structure du sol et de l'enrichir en matière organique.

Une pratique culturale couramment employée en Afrique du Nord et en particulier en Tunisie, est la jachère cultivée. Cette mode a le très gros inconvénient de favoriser cette érosion du sol tant par les eaux que par le vent (6).

L'érosion par les eaux est particulièrement à craindre en Afrique du Nord, du fait du régime pluviométrique de toute cette région : pluies rares et très brutales dont les eaux ravinent le sol et entraînent si elles ne trouvent aucun obstacle sur leur chemin.

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En Oranie septentrionale l'érosion actuelle est très violente et présente un grave danger pour le pays. Elle est principalement due à une déforestation très accentuée (7). Cette disparition de la forêt a provoqué, d'abord, une véritable steppisation des sols du pays et dans une seconde phase leur dégradation par érosion. L'influence des cultures intensives conduites immodérément y est particulièrement visible. Si des mesures très sérieuses ne sont pas prises pour parer à ce danger, nous assisterons à la transformation de grandes surfaces de cette riche région en un désert de pierres, de marne ou de grès.

L'érosion n'est pas aussi désastreuse sur tous les types de sols et l'Oranie septentrionale en présente de remarquables successions depuis les sols gris subdésertiques jusqu'aux sols podzoliques très évolués, sous forêt, dans les zones montagneuses (Ras Asfour). C'est sur les sols à carapace qu'elle est la plus néfaste, mettant rapidement à nu la carapace stérile.

La carapace ou croûte calcaire, formation très développée en Algérie, l'est aussi au Maroc. Dans la plaine irriguée de Kasba-Tadla, on peut en observer quatre types : stalactiforme, noduleuse, graveleuse et lamellaire, qui se distinguent les unes des autres par la forme qu'y ont prise les éléments calcaires accumulés (8).

L'origine de ces formations calcaires est très discutée (*). Rappelons seulement que, à la suite de ses observations sur les sols d'Espagne, puis du Maroc, Del Villar a mis en avant l'influence de la nappe phréatique dans ces phénomènes. Or, dans la plaine du Tadla, cette croûte, qui paraît bien se former actuellement, se situe à faible profondeur, alors que le niveau de la nappe phréatique varie entre 3 et 15 ou 20 m. Oudin, par contre, attache une certaine importance à un entraînement des substances et du calcaire en profondeur ; or les résultats analytiques paraissent prouver que c'est à la suite d'une remontée et d'une évaporation des solutions du sol que la carapace prend naissance.

Aussi néfaste que l'érosion des sols est leur salure, surtout dans les régions irriguées. Des expériences sont en cours actuellement à ce sujet, en particulier au Maroc, dans la plaine de Tadla. Les eaux d'irrigation provenant de l'Oued Oum er Rbia sont légèrement salées par elles-mêmes (0,3 à 1,5 p. mille NaCl suivant les saisons).

(*) On trouvera un résumé de cette question dans notre publication déjà citée : « Les sols de la France d'Outre-Mer ».

tion telle qu'elle a été pratiquée jusqu'à présent a provoqué toute cette région une remontée de la nappe phréatique en temps qu'une légère augmentation de sa salure. L'évolution de la nappe au cours du temps a pu être étudiée en détail en Algérie, dans la plaine irriguée du Bas-Chéliff, où il a été mis en évidence qu'elle est sous la dépendance d'une série de facteurs : les caractères de la région, caractères physiques des sols, hydrogéologie, mode, époque et volume des irrigations (9). Ces derniers facteurs sont modifiables par l'homme ; il faut donc les régler de façon que la remontée du niveau de la nappe et l'augmentation de sa salure ne puissent porter préjudice ni au sol ni aux cultures qu'il y a. En effet, le salant n'est pas dangereux seulement par la présence d'un excès de sels toxiques que les plantes absorbent, mais aussi par l'action de l'ion sodium sur le sol lui-même dont il détruit la structure. Pour permettre la mise en valeur des terrains salés et l'extension de nouveaux périmètres en utilisant des eaux plus ou moins salées, il est primordial d'éviter le relèvement du niveau de la nappe souterraine, et pour cela d'organiser le drainage général de la zone irriguée (10), drainage basé sur la topographie de la région et la nature de ses sols, mais aussi sur son régime hydrologique.

La France fait actuellement en Afrique du Nord, qu'il s'agisse d'Algérie, de la Tunisie ou du Maroc, un très grand effort d'organisation et de mise en valeur. En divers points des études détaillées ont été menées pour permettre de connaître les sols et de lutter contre les dangers qui les menacent : érosion, parfois sursalure. Ce sont là des études de longue haleine et dont les résultats n'apparaîtront que peu à peu ; elles n'en sont pas moins indispensables.

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- (2) KILLIAN (Ch.). — Sols de forêt et sols de savane en Côte d'Ivoire. Leurs caractères pédologiques, chimiques, physiques et microbiologiques. *Ann. Agron. nouvelle série*, t. XII, 1942, n° 3, 8 tabl., 5 fig.
- (3) SCAETTA (H.) et KILLIAN (Ch.). — Observations pédologiques et biologiques sur la latérite fossile, les sols latéritiques et les sols alluviaux de Gao-Bilakalo (Niger). *Bull. Soc. Hist. Nat. Afrique du Nord*, t. XXXII, 1941 (Mai à Juillet), p. 225-241, 1 pl., 6 fig.
- (4) KILLIAN (Ch.) et SCAETTA (H.). — Observations pédologiques et biologiques faites dans la zone d'épandage du Niger. (Résultats préliminaires d'une mission en A. O. F. 1938-1939). *Bull. Soc. Hist. Nat. Afrique du Nord*, t. XXXI, 1940, n° 7-12 (Juillet-Décembre), p. 113-126, 1 pl. h. t. (3 phot.), 2 fig., 1 tabl.
- (5) THOMAS (R.). — De la dégradation du sol, de la nécessité de sa conservation et de la possibilité d'une certaine régénération. *Bull. Agric. Congo Belge*, vol. XXXII, n° 4, Décembre 1941, p. 714-755, 9 fig. (79 à 81), 1 tabl.
- (6) GUILLOCHON (L.). — L'érosion et le ravinement des terres en Tunisie. *C. R. Acad. Agric.*, t. XXVIII, 1942, n° 9, p. 411-412.
- (7) MONJAUZE (A.) et AUBERT (G.). — Observations sur certains sols de l'Oranie septentrionale. Influence de l'érosion sur leur évolution. *C. R. Acad. Agric.*, à paraître.
- (8) MIEGE (E.). — Première note sur les sols du Tadla (Beni Amir). *Asso. Marocaine pour l'étude des sols*, Impr. réunis, Casablanca, 1941, in-8°, 82 pp., 14 tabl., 6 fig., 9 pl. h. t. (8 phot., 2 cartes, 1 tabl. graphique).
- (9) AUBERT (G.) et LEJEAILLE (G.). — Influence de certains facteurs sur l'évolution de la nappe phréatique dans les régions irriguées du Bas-Chéliff. *Ann. des Eaux et du Génie Rural*, fasc. 67, p. 163 à 177, 6 fig.
- (10) ROSEAU (H.) et GAUCHER (G.). — La mise en valeur des terrains à texture délicate et des terrains salés, 1 br., 36 pp., Imp. Vollo, Alger, 5 tabl.

Nous signalons aussi l'ouvrage suivant comportant de nombreux renseignements sur les sols, et dont il ne nous a pas été possible de l'ayant reçu que trop récemment, de tenir compte dans cette note :

- URVOY (Y.). — Les bassins du Niger. Etude de géographie physique et de paléogéographie Larose, Paris, 1942, 1 vol. in-4°, 149 p., 36 fig., 6 pl. h. t. (21 phot.), 4 cartes h. t.

HERBERT et A. MONJAUZE. — Observations sur quelques sols de l'Oranie Occidentale — Influence du Déboisement, de l'Erosion, sur leur évolution (1).

appuyée sur les massifs occidentaux de l'Atlas Tellien, au Sud-Ouest Monts Tlemcen qui atteignent 1800 m., à l'Est contreforts précédant l'Ouarsenis, l'Oranie occidentale est continuée par une série de plateaux peu élevés. Ces plateaux Tlemcen, Sidi-Bel-Abbès et Mascara, coupés par les vallées de la Tafna et de l'oued du Sig, de l'Habra, de la Mina, se continuent jusqu'à la Méditerranée par des plaines littorales ou sub-littorales d'importance inégale. Ce sont la plaine étroite de Marnia, la plaine d'Oran et de la Mléta, en partie occupée par le lac salé de la mer de Sebkhia, la plaine de Perrégaux, celle de Relizane et du Bas-Chélif. Un cordon des basses montagnes, entr'ouvert seulement à Oran et à la Macta, sépare ces plaines du littoral. Il constitue les massifs des Traras ou Kabylie oranaise, du Mur de Mostaganem et le chaînon de Bel Hacel, extrémité sud-occidentale du

D'un secteur à l'autre le compartimentage est complexe et les dénivellations sont fortes. Sur des versants tourmentés et des pentes assez raides se trouvent ainsi des sols avec une large extension les conditions les plus propices au jeu de l'érosion. Dans une partie de la région soit occupée, au Nord, par des grès pliocènes assez importants, au Sud par les calcaires dolomitiques durs du Jurassique supérieur, la majeure partie des sols se sont formés sur les schistes marneux du Crétacé supérieur, des sables éocènes et miocènes, du calcaire tendre tel que le calcaire à Lithothamnium ou des sables pliocènes ou quaternaires, tous sédiments aisément affouillables par les vents, s'ils sont en pente et dans tous les cas cédant facilement aux influences éoliennes.

La quantité de pluie varie suivant la disposition topographique, la longitude et la latitude. Ne dépassant pas 300 à 400 mm. — quand elle atteint les 300 mm. — sur les plaines de Marnia, Perrégaux, Relizane, une partie de celle d'Oran, s'élève à 500 mm. et davantage sur les plateaux, la lame d'eau annuelle peut en bonne moyenne dépasser 800 mm. dans les monts de Tlemcen et de l'Ouarsenis. Mais le caractère le plus marqué de ces précipitations est l'irrégularité de leur régime. Violentes en automne et en hiver, parfois au début du printemps, elles sont presque réduites à néant du 15 Mai au 1^{er} Septembre. Ainsi, à Relizane, à 70 m. d'altitude, la moyenne des années 1914 à 1924 a donné un total de pluie de 360 mm., réparti de 8 mm. du 1^{er} Septembre au 31 Décembre, 162 mm. du 1^{er} Janvier au 30 avril, 188 mm. du 1^{er} Mai au 31 Août. A Mascara, à l'altitude de 600 m., le total est de 525 mm. réparti, pour les mêmes périodes en 233, 236 et 56 mm. tandis qu'à l'altitude d'Hafir, élevée de 1270 m., dans les monts de Tlemcen, ces chiffres de-

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Appuyée sur les massifs occidentaux de l'Atlas Tellien, au Sud-Ouest Monts de Tlemcen qui atteignent 1800 m., à l'Est contreforts précédant l'Ouarsenis, l'Oranie nord-occidentale est continuée par une série de plateaux peu élevés. Ces plateaux de Tlemcen, Sidi-Bel-Abbès et Mascara, coupés par les vallées de la Tafna et de l'Isser, du Sig, de l'Habra, de la Mina, se continuent jusqu'à la Méditerranée par des plaines littorales ou sub-littorales d'importance inégale. Ce sont la plaine étroite de Marnis, la plaine d'Oran et de la Mléta, en partie occupée par le lac salé de la grande Sebkha, la plaine de Perrégaux, celle de Relizane et du Bas-Chélif. Un cordon de basses montagnes, entr'ouvert seulement à Oran et à la Macta, sépare ces plaines du littoral. Il constitue les massifs des Traras ou Kabylie oranaise, du Murdjado, de Mostaganem et le chaînon de Bel Hacel, extrémité sud-occidentale du Dahra.

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(1) *Compte-rendu sommaire des Séances de la Société de Biogéographie*, t. 23, n° 199, p. 44-51, 1946.

viennent respectivement 757, 285, 377 et 95 mm. Dans ces diverses stations le nombre de jours de pluie varie de 65 à 70 seulement (1).

Ainsi l'Oranie septentrionale constitue-t-elle à tous égards un milieu spécialement favorable à l'érosion.

Le régime thermique y est assez variable également. Si, par exemple, à Relizane, où la température baisse rarement en hiver jusqu'à -6 ou -7° , elle atteint en été, 46 à 48° à l'ombre, les monts de Tlemcen ou de l'Ouarsenis, par contre restent recouverts de neige plusieurs semaines chaque année, quelquefois plusieurs mois et la température s'y élève en été à des moyennes bien inférieures à celles constatées dans la plaine de la Mina.

A de telles variations dans les caractères du climat, dans la constitution du sous-sol, dans les caractères topographiques, correspond une grande diversité de sols, même en des points très rapprochés. Nous pouvons en donner un exemple caractéristique.

Si de Lalla Marnia, dont l'altitude est de 400 m., on gagne les monts qui, plus au Sud-Ouest, dominant la ville marocaine d'Oujda et, en particulier, le massif de Ras-Asfour, on peut noter la succession suivante :

Autour de Marnia s'observent quelques sols gris calcaires, assez jeunes d'aspect dont l'évolution apparente est typiquement celle des sols de climat très sec, steppiques et des sols gris carapace, cette carapace ne semblant pas d'ailleurs actuelle. Ces deux types qui interfèrent un peu partout supportent l'association du *Zizuphus lotus*. Celle-ci semble dériver elle-même d'une association plus complète dominée par *Pistacia atlantica* et *Olea europaea*. Les vieux pistachiers et les oliviers centenaires ne sont pas rares mais, mutilés à mort, disparaissent de jour en jour. Le terrain, défriché et labouré plusieurs fois mis à nu, mélangé et oxydé, semble jeune du fait de ce brassage et de cette usure. C'est la relique d'un sol vraisemblablement plus riche en humus mieux différencié. Actuellement ce n'est plus, en général, qu'un sol squelettique.

Un peu plus loin, au Sud-Ouest de la maison forestière de Sidi Zaher, les teneurs de sols en matière organique augmentent. Ils appartiennent au type des sols bruns à carapace. Ils sont recouverts par les substituts d'un *oleo-lentiscetum* pratiquement disparu et où le lentisque semble avoir tenu la place prépondérante jusque là réservée aux pistachiers de l'Atlas. Les faciès de dégradation sont différents suivant les points et les modes d'exploitation. L'association végétale la plus commune est la calycotomaie. Plus éloignés du centre et des sources de Marnia, ces sols ont même un caractère plus pauvre que les précédents. Telle est, probablement, l'une des causes de leur plus grande différenciation.

En continuant vers le Sud, la carapace disparaît en même temps que la pente commence à se faire sentir notablement. Les marnes et calcaires gréseux miocènes qui affleurent donnent naissance à des sols brun-rouge sur lesquels domine encore l'*oleo-lentiscetum*. Ils sont bientôt remplacés par des sols rouges méditerranéens, surtout développés sur des calcaires plus tendres ou sur des grès calcaires. Ils ont ensuite place, sur des marnes et des grès calcaires, à des sols bruns plus épais et dont le profil n'indique aucune migration des éléments. La pluviométrie dépasse 400 mm. A l'olivier et au lentisque s'ajoute le thuya de Barbarie (*Tetraclinis articulata*) parfois assez abondant. C'est alors l'association décrite sous le nom de Gallitraie, faciès oranais le plus classique.

(1) SETZLER (P.). — La carte pluviométrique de l'Algérie extr. du *Bulletin Soc. d'Hist. Nat. Afrique du Nord*, t. XXVIII, 3, p. 172 à 184 1 brochure, 13 pp. 6 cartes, h. t. Alger impr. Minerva, 1937.

de l'oléo-Ceratonion (1). Cette association ne peut être, sous l'influence de l'indigène, outissement provisoire d'un long passé d'incendies et d'excès de pâturage. Au Sud, on observe au lieu dit Korchef la présence du disa (*Ampelodesma Mauretunica*), sols plus lessivés, dont la roche mère est constituée par des schistes micacés. Ils sont peu (0 à 50 cm) et l'entraînement de éléments en profondeur est encore très faible. Ici la pluie atteint et dépasse 500 m/m. Un peu plus haut apparaît le chêne vert, résidu de taillis fois attaqués par le feu sur souches épaissies en gâteaux. Désormais l'importance de cette dans le peuplement augmentera assez rapidement avec l'altitude. Des sols bruns, plus es lessivés, couvrent les monts jusqu'au faite sur des roches mères diverses et même, dans es les plus pluvieuses, (versants exposés à l'Ouest-Nord-Ouest et plateau sommet), sur aires dolomitiques. Ces derniers sont parfois recouverts jusqu'au delà de Deglen (1350 m.) s sols rouges. Ceux-ci sont interrompus, lorsqu'apparaissent des calcaires plus tendres, par s proches des rendzines mais qui n'en possèdent pas tout-à-fait la structure caractéristique. s, sur les plateaux qui entourent les sommets des Ras-Asfour, ils prennent par places un ca- tourbeux et présentant même des horizons de gley. A Ras Asfour (1500 à 1580 m.) et t le plateau au sommet des monts (l'ataouine, Trois-Ponts, etc...), sous une belle futaie sur de chêne-vert, qui, par suite du pâturage, vieillit sans régénération, la migration des élé- est quelque peu plus accentuée. Les sols se rapprochent de la série podzolique.

épaisseur des horizons supérieurs, légèrement lessivés, peut atteindre dans cette région 30 cm., rarement davantage. Elle dépend des caractères physiques de la roche-mère, mais core du degré de l'érosion à laquelle est soumis le sol, trop souvent mis à nu par les in- s. Au-dessous se profile un horizon d'accumulation argileuse et ferrugineuse dont la puissance atteint 50 à 70 cm.

Le dernier horizon apparaît ainsi comme le résultat d'une podzolisation plus accentuée, sembl, mais qui date de longtemps déjà. Cette podzolisation ancienne serait-elle le témoin d'une métairie plus abondante liée, peut-être à une plus grande extension de forêts ? Il ne fait pas tte, dans tous les cas, que la montagne de Ras Asfour a porté dans un passé récent des bois étendus de chênes à feuilles caduques (*Quercus boetica*) dont la régression, à ce qu'on en juger par l'actuel spectacle, est due aux excès des bergers qui émondent et même abattent bres en été, pour alimenter leurs chèvres et aux incendies de forêts. Les reliques de cette ce, toujours mutilées, sont encore communes sur la montagne bien que très éparses et non apagnées de régénération.

En un point protégé de l'érosion par une ancienne cépée de chêne vert, nous avons pu, en observer un sol apparemment proche des podzols proprement dits. Il présentait un horizon les- très blanchi et dont la structure commençait à devenir cendreuse. Sa roche-mère était un sa- rovenant de l'altération des grès. En 1945, ce témoin caractéristique, cas exceptionnel, très sé, avait disparu finalement entraîné par l'érosion, l'indigène ayant détruit définitivement que cépée.

Cet aperçu rapide montre cependant toute la diversité des sols de la région. Des ersions analogues peuvent être observées en de nombreuses autres parties de anie septentrionale. Ailleurs apparaissent des rendzines typiques (Zemmora, e Farès, Aïne Témouchent, etc...) et même des sols steppiques apparentés aux ernozenes (régions de Martimprey du Kiss, Nédroma, etc...). Sur tous ces sols osion agit, mais pas partout avec une même intensité car à chaque type de sol espondent généralement des caractères différents du climat, principal facteur de légradation mécanique.

Si dans toute l'Oranie du Nord l'érosion est aujourd'hui très violente, il n'en as été toujours de même dans le passé. Le meilleur obstacle à l'entraînement des es est en effet la forêt, non seulement par ses arbres mais encore et surtout par la

(1) MAIRE (Dr R.). — Carte phytogéographique de l'Algérie et de la Tunisie. *Alger, Gouv. nér. de l'Algérie. Direction de l'Agric., du Comm. et de la Colonisation. 1925, In 4° 78 pp. pl. (60 phot.) 1 carte h. t. col.*

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(1) SETZLER (P.). — La carte pluviométrique de l'Algérie extr. du *Bulletin Soc. d'Histoire de l'Afrique du Nord*, t. XXVIII, 3, p. 172 à 184 1 brochure, 13 pp. 6 cartes, h. t. Alger Minerva, 1937.

l'alliance de l'oléo-Ceratonion (1). Cette association ne peut être, sous l'influence de l'indigène, que l'aboutissement provisoire d'un long passé d'incendies et d'excès de pâturage.

Plus au Sud, on observe au lieu dit Korchef la présence du disa (*Ampelodesma Mauretunica*), sur des sols plus lessivés, dont la roche mère est constituée par des schistes micacés. Ils sont peu épais (40 à 50 cm) et l'entraînement de éléments en profondeur est encore très faible. Ici la pluviométrie atteint et dépasse 500 m/m. Un peu plus haut apparaît le chêne vert, résidu de taillis plusieurs fois attaqués par le feu sur souches épaissies en gâteaux. Désormais l'importance de cette essence dans le peuplement augmentera assez rapidement avec l'altitude. Des sols bruns, plus ou moins lessivés, couvrent les monts jusqu'au faite sur des roches mères diverses et même, dans les zones les plus pluvieuses, (versants exposés à l'Ouest-Nord-Ouest et plateau sommetal), sur les calcaires dolomitiques. Ces derniers sont parfois recouverts jusqu'au delà de Deglen (1350 m.) par des sols rouges. Ceux-ci sont interrompus, lorsqu'apparaissent des calcaires plus tendres, par des sols proches des rendzines mais qui n'en possèdent pas tout-à-fait la structure caractéristique. Ailleurs, sur les plateaux qui entourent les sommets des Ras-Asfour, ils prennent par places un caractère tourbeux et présentant même des horizons de gley. A Ras Asfour (1500 à 1580 m.) et sur tout le plateau au sommet des monts (l'ataouine, Trois-Ponts, etc...), sous une belle futaie sur souches de chêne-vert, qui, par suite du pâturage, vieillit sans régénération, la migration des éléments est quelque peu plus accentuée. Les sols se rapprochent de la série podzolique.

L'épaisseur des horizons supérieurs, légèrement lessivés, peut atteindre dans cette région 30 à 40 cm., rarement davantage. Elle dépend des caractères physiques de la roche-mère, mais plus encore du degré de l'érosion à laquelle est soumis le sol, trop souvent mis à nu par les incendies. Au-dessous se profile un horizon d'accumulation argileuse et ferrugineuse dont la puissance peut atteindre 50 à 70 cm.

Ce dernier horizon apparaît ainsi comme le résultat d'une podzolisation plus accentuée, semble-t-il, mais qui date de longtemps déjà. Cette podzolisation ancienne serait-elle le témoin d'une pluviométrie plus abondante liée, peut-être à une plus grande extension de forêts ? Il ne fait pas de doute, dans tous les cas, que la montagne de Ras Asfour a porté dans un passé récent des boisements étendus de chênes à feuilles caduques (*Quercus boetica*) dont la régression, à ce qu'on peut en juger par l'actuel spectacle, est due aux excès des bergers qui émondent et même abattent les arbres en été, pour alimenter leurs chèvres et aux incendies de forêts. Les reliques de cette essence, toujours mutilées, sont encore communes sur la montagne bien que très éparses et non accompagnées de régénération.

En un point protégé de l'érosion par une ancienne cépée de chêne vert, nous avons pu, en 1942, observer un sol apparemment proche des podzols proprement dits. Il présentait un horizon lessivé, très blanchi et dont la structure commençait à devenir cendreuse. Sa roche-mère était un sable provenant de l'altération des grès. En 1945, ce témoin caractéristique, cas exceptionnel, très localisé, avait disparu finalement entraîné par l'érosion, l'indigène ayant détruit définitivement l'antique cépée.

Cet aperçu rapide montre cependant toute la diversité des sols de la région. Des successions analogues peuvent être observées en de nombreuses autres parties de l'Oranie septentrionale. Ailleurs apparaissent des rendzines typiques (Zemmora, Aïne Farès, Aïne Témouchent, etc...) et même des sols steppiques apparentés aux Chernozemes (régions de Martimprey du Kiss, Nédroma, etc...). Sur tous ces sols l'érosion agit, mais pas partout avec une même intensité car à chaque type de sol correspondent généralement des caractères différents du climat, principal facteur de la dégradation mécanique.

Si dans toute l'Oranie du Nord l'érosion est aujourd'hui très violente, il n'en a pas été toujours de même dans le passé. Le meilleur obstacle à l'entraînement des terres est en effet la forêt, non seulement par ses arbres mais encore et surtout par la

(1) MAIRE (Dr R.). — Carte phytogéographique de l'Algérie et de la Tunisie. Alger, Gouv. Génér. de l'Algérie. Direction de l'Agric., du Comm. et de la Colonisation. 1925, In 4° 78 pp. 36 pl. (60 phot.) 1 carte h. t. col.

végétation arbustive et herbacée qui se développe sous leur couvert ainsi que par litière des feuilles mortes. Or l'Oranie fut, il y a peu de temps, une contrée beaucoup plus boisée. De nombreux documents en font foi ainsi que les restes, souvent des plus humbles, de plantes appartenant à des associations forestières disparues. En bien des zones actuellement dénudées, isolés au milieu des terres de culture sur les talus des chemins, survivent encore, offerts à tous les regards, quelques arbres témoins ou des touffes basses d'essences forestières réduites par la dent des chèvres à quelques décimètres de hauteur. Telle colline rocheuse et dénudée se montre de près parsemée comme de lichens verts foncés qui ne sont que des oliviers centenaires, plutôt ce que l'homme en a laissé. Ainsi en est-il des collines du Murdjadjo, auprès d'Oran ou, plus à l'Est, de certains abords de la vallée du Chélif.

De l'observation des caractères morphologiques des sols on peut quelquefois déduire une genèse effectuée anciennement sous l'influence d'associations forestières aujourd'hui disparues. Ainsi en est-il sur les contreforts de l'Ouarsenis, au Sud de Relizane ou à la Colonne Montagnac, entre Lalla Marnia et Nemours. En ce dernier point, par exemple, nous avons pu observer, sur une pente de 45° exposée au Nord, au sol assez épais protégé par une touffe de palmier nain. Son profil était le suivant : 0 à 25 cm., horizon dégradé, assez argileux, appauvri en humus. 25 à 100 cm., horizon très riche en humus, à structure granuleuse jusqu'à 50-60 cm. de profondeur, puis plus polyédrique, en même temps que de teneur croissante en argile. 100 à 125 cm., horizon assez argileux brun-rougeâtre à structure polyédrique. En dessous, le tuf blanc sableux avec quelques noyaux calcaires.

L'histoire de ce sol semble se résumer ainsi : Sous une végétation forestière moyennement dense, s'est constitué autrefois un sol du type des terres rouges méditerranéennes. Le couvert se serait refermé étroitement après ouverture de la forêt, mais sous un peuplement d'allure steppique dont les débris organiques, en s'accumulant, ont donné naissance à un sol proche des Chernozems. Actuellement le peuplement steppique est, lui-même, extirpé. Le sol mis à nu se dégrade, s'appauvrit en humus et disparaît.

La végétation confirme l'existence de ces stades forestiers et steppiques précédant l'actuel stade de dégradation. Elle comporte, sur un sol en apparence dénudé, quelques rares rejets, abrutis au ras du sol, de *Callitris*, de *Quercus coccifera* et de *Pistacia lentiscus*. Il existe quelques *Cistus clusii* épars, des touffes de *Daphne gnidium*, *Viola arborescens*, *Globularia alypum*, *Lavandula dentata*, tous chamaephytes réduits par le pâturage à des chicots. Bien qu'exploités à fond, *Chamaerops humilis* et *Ampelodesma Mauretanica*, éléments de la steppe, sont encore assez abondants. *Stipa tenacissima* l'est beaucoup moins. Enfin *Teucrium pseudochamaepesthis*, *Asphodelus microcarpus*, *Urginea maritima* sont avec des *Poa* et *Ariserum* les essences secondaires les plus marquantes.

Dans le sol on trouve encore de nombreuses racines pourries, mais rarement de fort diamètre, que les Berbères extraient avec avidité, ayant désormais exploité, carbonisé, vendu et consommé tout le combustible ligneux du pays. On voit donc que dans un passé très récent un maquis, à demi-steppisé, occupait ces pentes. C'était là, dans la région, le type du bon terrain de parcours qui devait depuis de longs siècles, se maintenir entre les incendies successifs. Quant à l'histoire documentaire, elle montre que ce canton pouvait il y a cinquante ans passer encore pour forêt puisqu'il avait été classé comme domanial et soumis au régime forestier. Il l'est encore, d'ailleurs, bien que, pratiquement, la dernière souche vive en ait été extirpée par la population riveraine.

Il se trouve qu'au milieu de ces précisions, la donnée périologique est encore la plus complète puisqu'elle montre que le passé steppique ou mixte forestier-steppique serait lui-même postérieur à un passé réellement forestier, les couches inférieures

du sol évoquant en effet ces boisements touffus, mais faisant équilibre à un certain pâturage, typiques des basses montagnes méditerranéennes.

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Un tel exemple, qu'on pourrait multiplier à l'infini montre quel est l'agent des substitutions des formations pédologiques et phytologiques.

L'indigène est le grand destructeur de l'arbre. Ses usages primitifs ne l'élèvent guère à la conception du patrimoine objectif, territorial, mesurable, susceptible d'être hérité, accru et légué. L'exploitation qu'il pratique est toujours extensive et consiste surtout à tirer parti des choses au jour le jour, à consommer les biens naturels qui lui sont impartis et, en cas d'accroissement démographique protégé, tout se transforme en désert. Il agit par le pâturage et le labour. L'action néfaste des troupeaux, spécialement des troupeaux de chèvres, est d'autant plus forte que le climat du pays est plus sec, que l'arbre détruit se régénère en conséquence plus difficilement. Les travaux sont effectués sans précaution, quelle que soit la pente, et l'usure d'un humus sans aucun apport de fumier ne remplace jamais détruit la cohésion des terres.

Mais l'indigène n'est pas seul responsable. Le colon, vite assimilé aux facilités de la vaine pâture et de la culture extensive, l'est tout autant. Lui aussi défriche modérément sur les collines aux pentes les plus accentuées et sans prendre la moindre précaution contre l'entraînement du sol arable par les eaux.

Lorsque les conditions climatiques sont favorables, si la topographie n'exagère pas trop le jeu de l'érosion, si enfin l'action humaine n'est pas trop accélérée, la destruction de la forêt n'est pas suivie aussitôt de la dégradation du sol. Le passé récent de l'Afrique du Nord est caractérisé par cette évolution pédologique, étape qui aujourd'hui, dans une phase de plein dynamisme destructeur, ne semble plus se manifester. Mais de cette étape il reste d'innombrables traces. Sous une végétation de ramifères *Ampelodesma*, *Mauretanica*, *Stipa tenacissima*, voire *Lygeum Spartum* et d'essences ligneuses telles que *Chamaerops humilis*, de beaucoup le plus répandu à Oranie du Nord. *Artemisia Herba-alba*, *Noaea mucronata*, etc... s'est formé un sol steppique que l'on peut rapprocher soit des Chernozems, soit, là où la pluviométrie est plus forte, des Chernozems dégradés, soit, sous un climat plus sec (alfa-armoise), des sols gris ou bruns steppiques. Cette évolution du sol peut être fonction de la densité du couvert vivant aussi bien que de l'état plus ou moins herbacé ou frutescent du peuplement.

En effet la steppisation apparaît, dans ce pays, comme une réaction de la vie végétale à la suite de l'usure par l'homme des massifs ligneux préexistants. A des sols faiblement couverts par des forêts en mauvais état ont donc succédé des sols trop étroitement protégés par le couvert bas et dense des hémicryptophytes et chamaephytes.

Un bel exemple de sol dont l'évolution récente s'est rapprochée de celle des Chernozems a pu être observé à 32 kms environ de Marnia, sur la route de Martimprey du Kiss. Son horizon supérieur très humifère, très noir, épais de 50 cm. et possédant la structure grenue caractéristique de ce type, en surmonte un second encore bien pourvu en humus et assez riche en concrétions calcaires mais présentant une structure granuleuse moins nette. Autour, le terrain était défriché mais portait encore des touffes de palmier nain à l'époque de l'observation. Malgré la très forte pente, un ouvrier était d'ailleurs en train de les extirper. Sur les croupes entre l'Oued ed Dien et l'Oued

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Mekralfa, à 17 km à l'Est de Nédromah, l'épaisseur des horizons humifères dépasse 1 m. et ils sont séparés de la roche-mère, produit de décomposition de roches basaltiques, par un horizon épais de 50 à 60 cm. d'un brun rouge, un peu argileux et beaucoup plus compact que les horizons supérieurs. Là encore on évoque une ancienne forêt du type méditerranéen à laquelle a fait suite pendant des siècles un peuplement mixte de forêt steppe dont les derniers éléments sont, dans le cas particulier, encore visibles, par lambeaux, sur le terrain. Dans la région de Tlemcen ou autour de Pont de l'Isser, les sols à tendance steppique doivent être rapprochés des Chernozems dégradés ; la pluviométrie y est d'ailleurs plus forte que dans le secteur de Mamia et Nédromah.

Lorsque l'homme accélère — comme c'est le cas présentement — son exploitation des peuplements ou lorsque la position topographique amplifie le jeu de l'érosion, celle-ci décape le sol progressivement. Elle entraîne d'abord des horizons humifères. Or ce sont ceux qui présentent la structure la plus favorable au développement des plantes et, grâce à leur teneur en humus, facilitent l'emménagement de l'eau qui restera à la disposition de la culture. Ils constituent aussi les couches les plus riches en microorganismes dont l'activité est indispensable à la croissance des végétaux supérieurs. Mais alors que dans les sols des régions humides les horizons superficiels sont appauvris en éléments fertilisants, il n'en est pas de même dans les sols de pays secs et chauds où la migration des éléments les plus solubles se fait « per ascensum ». En progressant, l'érosion peut d'ailleurs enlever non seulement les horizons supérieurs mais même l'ensemble du sol.

De toute façon, à intensité égale, les phénomènes érosifs sont toujours plus néfastes dans les zones les plus sèches où, d'une part, l'humus ne peut s'accumuler aisément ou se maintenir longtemps, étant trop rapidement oxydé, où, d'autre part, la végétation adventice demeure trop réduite pour en fournir au fur et à mesure de sa disparition, une fois supprimé le peuplement originel ; là également où les horizons inférieurs ou la roche sous jacente sont de nature rocheuse. C'est le cas des régions de sols à croûte.

Comme nous l'avons vu plus haut, malgré une topographie peu mouvementée, l'érosion a réduit les sols gris-brun à carapace calcaire de la région de Lalla Mamia à quelques 5 ou 10 cm. de terre au-dessus de cette carapace. Celle-ci, par places, apparaît même en surface et est attaquée par les agents atmosphériques. Aussi le sol, très caillouteux, constitue-t-il un milieu particulièrement aride. La végétation, jadis, probablement, forêt de bétoums, (*Pistacia Atlantica*), les superbes arbres de fer Nord-Africains, est réduite aux lambeaux d'associations entièrement dégénérées. A la fin s'installe un véritable désert de pierres. Et cette dégradation est tellement rapide, que sa progression devient apparente à quelques années d'intervalle, aux yeux de l'observateur !

Un autre paysage pédologique trop commun en Oranie du Nord peut être observé sur les collines de la région d'Aïn-Kial, entre Tlemcen et Aïn-Témouchent. Des calcaires sableux blancs sont surmontés par un sol brun rouge, subforestier, dont l'épaisseur peut atteindre 80 cm. à 1 m. L'érosion en nappe décape le sol. Autour de zones peu atteintes et dont la couleur reste très foncée, elle fait apparaître des auréoles plus rouges, l'horizon inférieur du sol se trouvant découvert, et même de grandes taches blanches constituées par la roche mère. Là, au point choisi, autour d'une ferme européenne, au sommet d'une colline, s'étendent un vignoble puis des cultures. Les rangs de vigne sont pour la plupart disposés et labourés suivant les

lignes de plus grande pente et les sillons forment, à l'époque des pluies, autant de petits ravins. Auprès de la ferme, le sol n'existe plus. Le calcaire sableux blanc occupe toute la surface et ce n'est que plus à l'écart, là où la culture est moins intensive, que le sol réapparaît sur les pentes et présente sur une épaisseur variable les deux horizons : le supérieur plus foncé, plus riche en humus, puis même, plus loin encore, l'inférieur plus rouge, sans être sensiblement plus compact.

Ces quelques observations, très rapides, montrent à quel point les sols de l'Oranie Nord-occidentale — et ce que nous avons dit de cette région pourrait s'appliquer à beaucoup d'autres parties de l'Algérie — sont attaqués et dégradés par l'érosion.

La défense de ces sols pose un problème urgent. Un Service en voie de création est chargé de cette tâche. Il faudra, dans certains cas, effectuer des ouvrages de quelque importance et ressortissant à l'art de l'Ingénieur, tels que des barrages dans les ravins ou des canaux de dérivation. Le plus souvent il sera nécessaire, pour lutter contre l'érosion en nappe, d'établir des gradins, des murettes ou des haies le long des lignes de niveau. Partout il importera d'éduquer le cultivateur, colon ou indigène, pour éviter, là où le sol est déclive, la destruction de la végétation naturelle forestière ou frutescente, pour remplacer les cultures, sur les pentes les plus fortes, selon le cas, par des reboisements ou des plantations d'arbres fruitiers établies sur banquettes. Plus rarement, lorsque l'humidité du sol le permettra, on pourra songer à installer des pâtures entretenues. Sur les pentes douces, il sera nécessaire de labourer en suivant les lignes de niveau, de pratiquer des assolements en bandes alternées horizontales afin que la pente reste toujours coupée par des surfaces couvertes de végétation. Il conviendra enfin de réserver aux pentes les plus faibles les cultures sarclées permanentes, telles que la vigne, qui favorisent spécialement l'érosion. Rien que cela sera une révolution mais la défense du sol et sa restauration ne peuvent être, dans tous les cas, qu'une révolution puisqu'il s'agit de réformer les concepts humains les plus vivaces et par conséquent de transformer complètement l'économie qui en fut la génératrice et la longue justification. L'économie nouvelle pour s'implanter devra être riche et ne pas s'accommoder de petits moyens. Elle sera marquée par l'aménagement et la normalisation du verger sur banquettes, du verger de montagne à olivier, figuier, caroubier, prunier, amandier sur toutes les pentes un peu fortes, c'est-à-dire le 1/3 de la surface de l'Algérie, par la création des industries agricoles de séchage, extraction et conditionnement correspondant à cette production fruitière et par le développement des marchés d'exportation susceptibles de l'absorber, par la réduction puis la suppression de la vaine pâture et par la constitution des rations d'étable compensatrices, facteurs de l'élevage intensif et bases des industries laitières.

A cette révolution qui s'accompagnera, dans l'ordre social, de l'extension des modes d'exploitation coopératifs et collectifs, de l'accession, condition expresse de la réussite, de masses formées à l'orientale aux conceptions objectives de l'Occident, il convient de s'attacher de suite, sans faiblesse.

L'œuvre qui nous attend est immense. Elle ne doit être accomplie qu'avec des moyens adéquats et selon des prévisions planifiées. Elle doit être et sur une grande échelle entreprise de suite si nous ne voulons être confirmés dans ce pays comme les pionniers du désert.

(Communication présentée par l'Auteur)

of the uplands, since this statement can certainly not apply to the very large and important areas of Alluvial soils.) He says the sandy soils of northern Algeria receive good rains and are excellent for cork oaks. He shows two monoliths, one of a Brown Forest soil and the other of a sandy podzolized soil. According to his observations, an annual rainfall of at least 1200 millimeters is essential for a podzolized forest soil in the neighborhood of Algiers. He says that there are some representative Terra Rossas on limestone near Algiers. He emphasizes that evergreen oaks were important in the original vegetation of the mountains. He says that the junipers growing near the sea are not very reliable indicators of the soil, since they grow under a wide range of conditions. Much of the natural cork oak is gone and a great deal of the live oak has been destroyed for fuel or by burning the land. In his report he describes the vegetation in Algeria by regions defined almost wholly on the basis of rainfall. He is trying to indicate the places where introduced forest might succeed and where he thinks it will be bound to fail. Locally he says that soils are related to relief and character of rock. I think he underestimates the importance of these factors other than rainfall.

He says there are 3,173,000 hectares covered by forest in Algeria. The greater part of this belongs to the State.

I need to leave for a time in order to make arrangements for an appointment with the dentist. Somehow I broke the filling out of a tooth. The street numbers in Algiers are extremely difficult to locate. After a great deal of looking for the address, I finally discover the office of the dentist -- Dr. Brahan, recommended by Mrs. Finley -- directly opposite our meeting place!

I go to see him at 3 o'clock. It is hot, and there is a brown haze of dust in the air carried in by the winds from the Sahara. The dentist puts in a temporary filling and demands that I return Wednesday at 2 o'clock.

I return to the conference at 3:15 and can understand only a little. It is all very fast French in a terribly noisy room. Most of the papers are rather elementary.

Later in the afternoon we get an example of a real sirocco -- the famous dust storms from the Sahara. It is stopped with a rain storm, which looks like a rain of blood. After the storm I collect a sample of the dust for later examination.

In the early evening the members of the American delegation are received by Mr. Finley, the American Consul-General, and his wife. They have a large beautiful old Moorish house with a gorgeous garden. He and his staff discuss with us the local political situation and so on in Algeria. He and Mrs. Finley

Note. Dr. Humbert of our laboratories examined the sample of dust collected from the sirocco and reports as follows:

"I have examined the dust from sirocco and find it to be a highly calcareous fine grained deposit. It has less than 5% heavy minerals. It is essentially quartz, feldspar, and mica in that order of abundance aggregated by CaCO_3 , iron oxides, and clay. There is an abundance of clay aggregates of silt size. If completely dispersed the sample would contain a high proportion of clay. Marine deposition is integrated in the history of this material. Marine organisms were plentiful."

are planning to spend a month's leave in Madrid (sic) beginning next week. I inquire about the plans of the French for a superphosphate plant and find that they have done nothing at all beyond the plans.

I return to the hotel for a late dinner and to bed.

May 13: Field trip in the neighborhood of Algiers

We are up early and in the bus at 7:30 a.m. We go along the bay southeast of Algiers. There are still a few bombed ships partly sunk in the water. We pass Harrach near Mon Carree'. The road is very rough. Just as we climb over the escarpment the land is gently undulating. Here there are many fruit and vegetable gardens and some military camps. In a short distance we are on an undulating plain with many cereals, especially barley, along with wine grapes and hay. Along the roads are many hedges of acacia.

We make a stop to look at several profiles on this gently undulating plain. Previously the land had been plowed deeply. Again there are such large crowds that it is very difficult to see the profiles and take samples.

This plain seems to have been developed from Quaternary deposits. Where I look at the soil at first it is quite heavy. This profile is difficult to classify. It has characteristics suggesting Brown Forest, Planosol, and Gray-Brown Podzolic:



K-1303 May 13, 1947
 Algeria. Southeast of Algiers. Making hay
 on yellowish-brown heavy soil on terrace.

- | | | |
|----------------|---------|--|
| A
p | 0-11" | Dull grayish and yellowish-brown sandy clay; nearly massive; hard when dry. |
| B ₁ | 11-29" | Bright yellowish-brown heavy sandy clay, with coarse blocky structure; the aggregates have shiny coatings. |
| B ₂ | 29-34" | Yellowish-brown heavy sandy clay with indistinct coarse blocky structure and nearly black small concretions. |
| B ₃ | 34-46" | Yellowish-brown heavy sandy clay; nearly massive, with some evidence of coarse, blocky. |
| C | 46-60"± | Yellow to light yellowish-brown, massive, calcareous sandy clay; with many concretions of calcium carbonate. |

I look at another profile in a lower place where the slope is about 2 percent. This is a hydromorphic associate of the first profile:

- | | | |
|----------------|---------|--|
| A
p | 0-20" | Grayish-brown silty clay. |
| B ₃ | 20-25" | Transitional. |
| C ₁ | 25-40" | Gray calcareous silty clay. Massive and soft. |
| C | 40-60"± | Mottled yellow, yellowish-brown, and gray calcareous silty clay. |

On the slope just above this profile the surface soil is reddish-brown.

An excavation was opened nearby on a short slope of about 5 percent in a poor place to make a profile:

- 0-10" Buff grayish and yellowish-brown
sandy clay; nearly massive; hard when dry.
- 11-25" Buff yellowish-brown heavy sandy clay,
with coarse blocky structure; the upper
part has thin coatings.
- 25-35" Yellowish-brown heavy sandy clay with in-
distinct coarse blocky structure and
nearly black small concretions.
- 35-45" Yellowish-brown heavy sandy clay; nearly
massive, with some evidence of coarse,
blocky.
- 45-50" Yellow to light yellowish-brown, massive,
calcareous sandy clay; with many nume-
rous of calcareous concretions.

I look at another profile in a lower place where the
slope is about 5 percent. This is a hypomorphous escarpment of

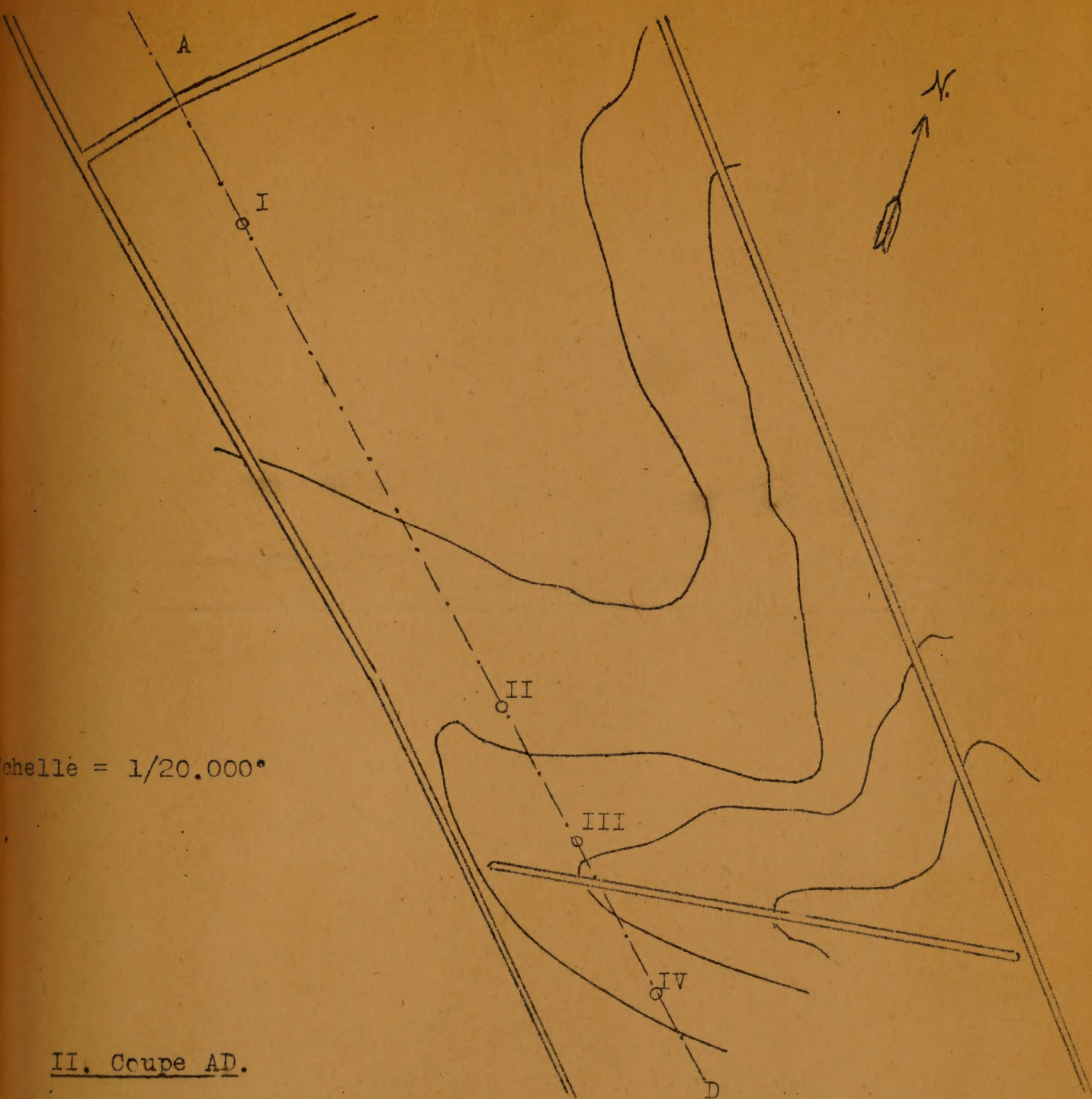
The first profile:

- 0-20" Grayish-brown silty clay.
- 20-25" Transitional.
- 25-35" Gray calcareous silty clay. Massive
and soft.
- 35-50" Reddish yellow, yellowish-brown, and gray
calcareous silty clay.

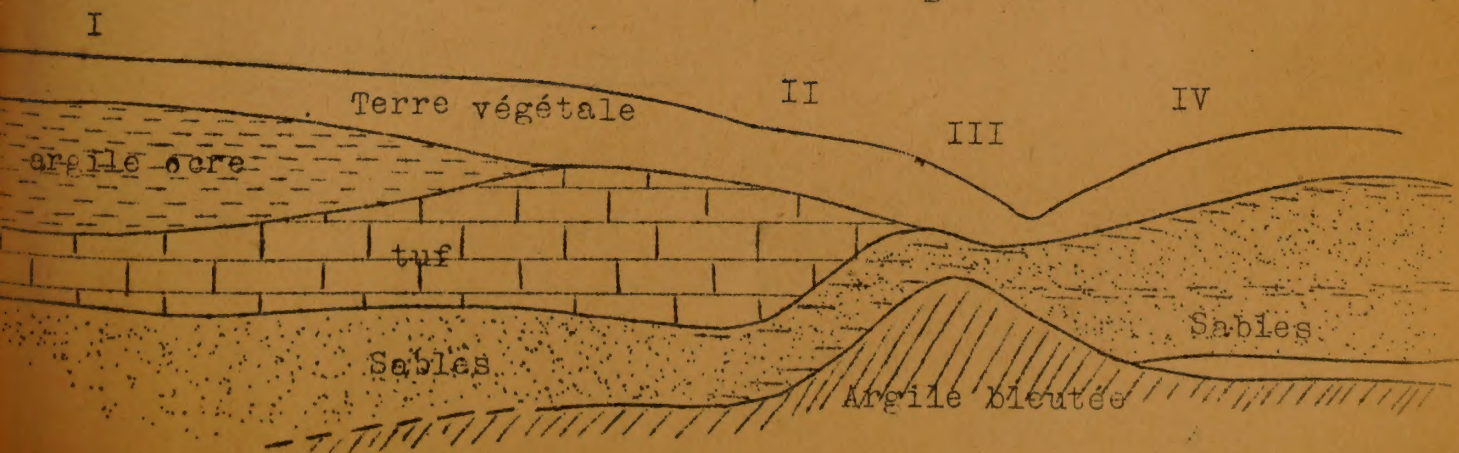
On the slope just above this profile the surface soil
is reddish-brown.

An excavation was opened nearby on a short slope of
about 5 percent in a poor place to make a profile:

I.- PLAN



II. Coupe AD.

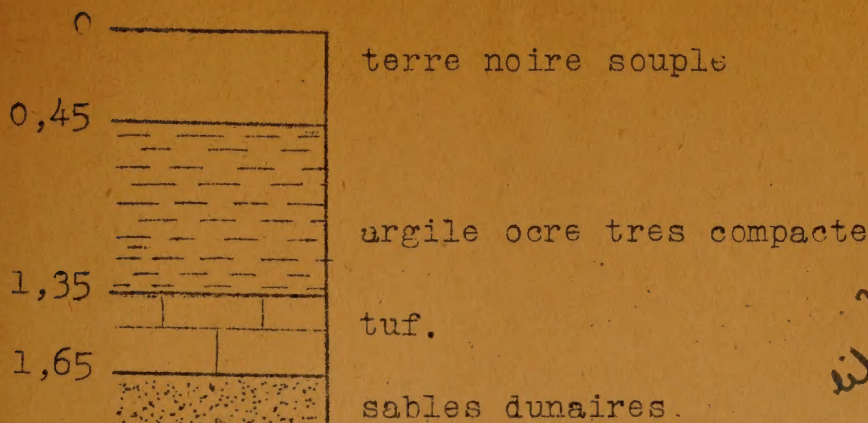


Echelles: Longueurs = 1/20.000°

Hauteurs = 1/50°

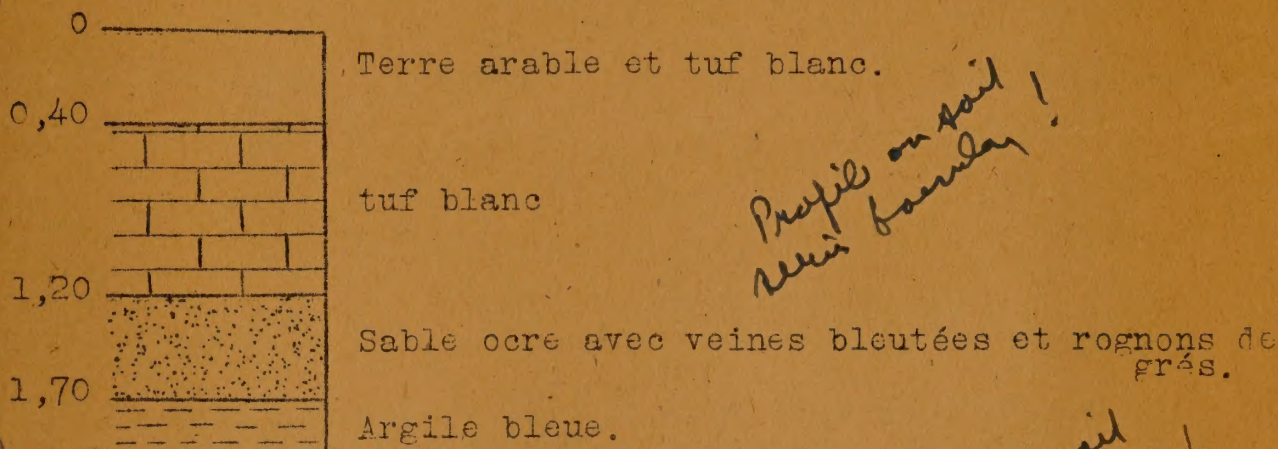
Profils suivant A D direction NW - SE : Puits I - II - III - IV

Puits I



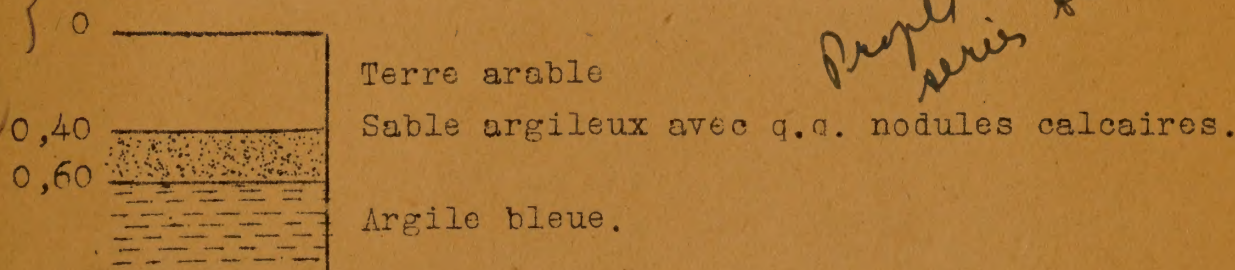
9 AP
B.F.
Mont representatif - but
libre est bien drainé
moyen pour vives herbes
dans soil.

Puits II.



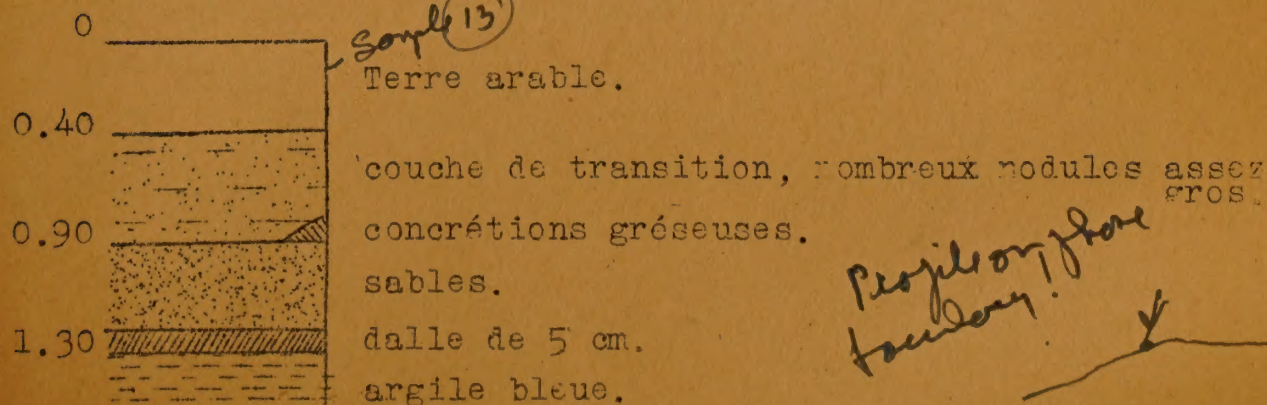
Profil on soil
series favorable!

Puits III.



Profil on soil
series favorable!

Puits IV.



Profil on floor
favorable!

eroded - poor floor.

Photo 7.2

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ALGER - MAI 1947

El-ALIA (PARCELLE A-16)
altitude 350

COUPE SUIVANT AD, de direction approximative N.O/S.E.
(englobant les puits I, II, III, IV.)

Les horizons (ici géologiques) du sous-sol sont très différents d'un puits à l'autre.

D'une manière générale on trouve dans le sous-sol à partir de la surface.

	: pH :	terre :	Composition granulométrique de la terre fine				
		fine %:	p.100.				
			s. gr.:	S.fins :	limon :	argile :	Calcaire :
Argile ocre. ...	6,8:	96	16,4	21,3	13,4	48,6	0
Tuf.	8,0:	100					73,0
Sables	8,2:	91,3	39,4	24,2	2,0	21,3	11,3
Argile bloutée.:	8,4:	99,5	1,5	2,3	23,0	57,0	15,8

Sur ce sous-sol hétérogène la terre arable présentant une épaisseur de 0m,40 environ est de couleur variable, selon l'affleurement.

La composition moyenne de cette terre arable lorsqu'elle repose immédiatement sur l'argile ocre, est la suivante :

	: pH :	terre :	S.gr. :	S.fins :	limon :	argile :	calcaire :
		fine :					
Terre arable.	6,8:	99,8	20,3	36,1	16,3	27,2	0

Les sables ont une composition granulométrique différente suivant les puits - ils sont plus riches en sables grossiers et plus pauvres en argile en allant du Nord au Sud. Ce sont donc des dépôts d'origine pluviale, le cours de cette rivière étant vers le sud de la parcelle, les dépôts vers le Nord étant surtout des dépôts de débordement.

Le tuf présente aussi une teneur en calcaire variable suivant les puits - il est également d'une friabilité différente.

Puits :	Calc.p.100 :	Cailloux &	
		graviers p.100 :	
I :	41	9	
II :	73	0	

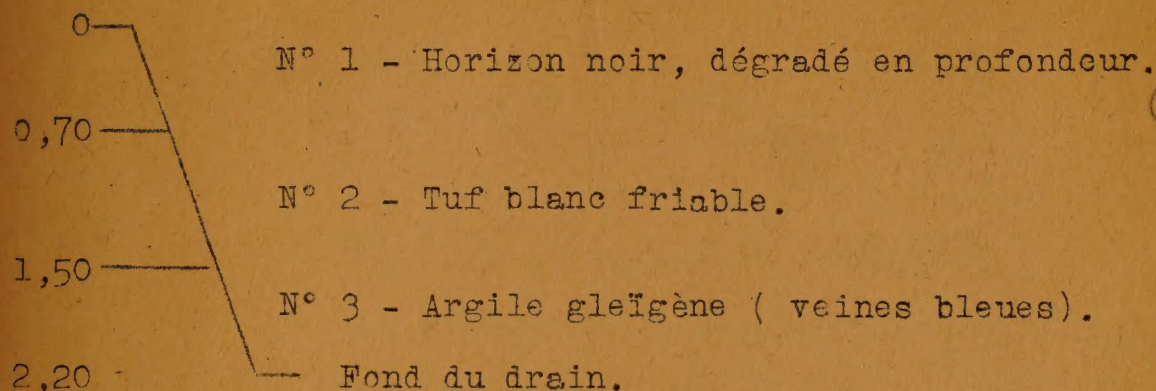
ALGER - MAI 1947.

EST-MITIDJA

Point de Prélèvement : NADJEMA (talus de drain).

PROFIL :

(altitude 28 m.)



Souple 18
Cherbourg
Montebello
Cherbourg
Est bank

ANALYSE PHYSIQUE p.100 de TERRE FINE : N° 1 : N° 2 : N° 3 :

p.H.	7,4	7,7	8,0
terre fine pour cent	100	100	100
argile	42,7	11,9	23,8
Calcaire colloïdal	0	3,8	5,1
Limon non calcaire	22,0	33,0	19,3
" calcaire	0	12,0	20,0
Sables fins siliceux	24,4	15,6	25,9
" " calcaires	0	5,1	2,0
Sables grossiers siliceux	2,9	7,5	3,3
Sables grossiers calcaires	0	11,7	1,0
Calcaire total	7,5	34,5	27,3
Humus	0,2	0,1	0,1
Matière organique	6,0	2,8	1,3

ANALYSE CHIMIQUE en mgr p.100 DE TERRE FINE.-

Azote total	310,0	140,0	65,5
P ² O ⁵ assimilable	3,7	8,1	5,7
K ₂ O échangeable	41,1	24,1	27,6
Chlorures en NaCl	7,8	11,5	26,0
Fe libre	64,0	68,8	121,0

CONFERENCE DE PEDOLOGIE MEDITERRANEENNE

ALGER - MAI 1947

EST MITIDJA

Berge de l'Oued BAREK (FONDOUK)

Type sol gris, jeune des vallées. Sol homogène sur toute la hauteur de la berge.

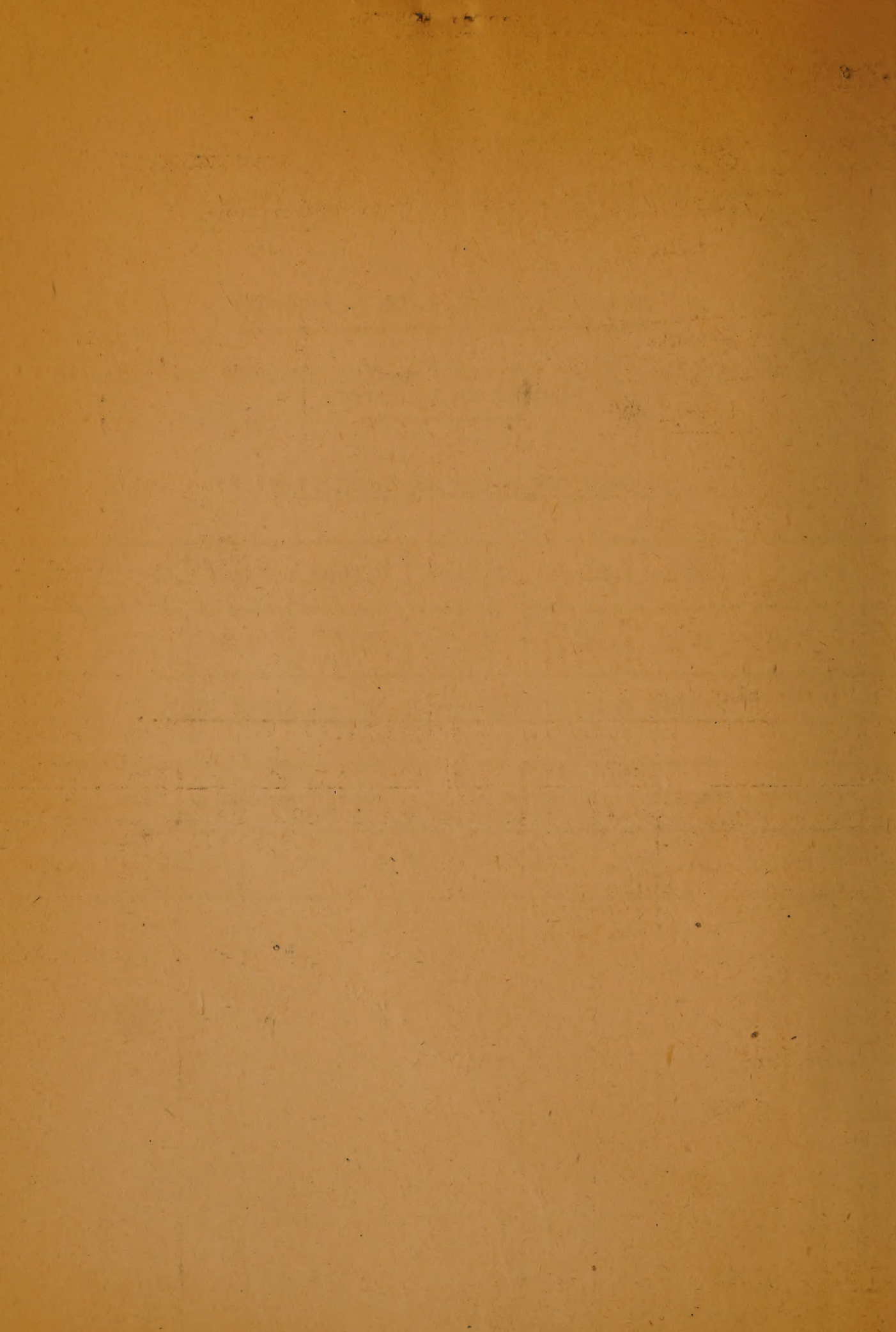
ANALYSE PHYSIQUE p.100 DE TERRE FINE

Terre fine.	p.H.	Argile	Limon	S.fins	S.gros.	Humus	Mat. org.	Calc. total
99,5	7,8	31,0	30,3	31,3	2,7	0,2	2,4	3,8

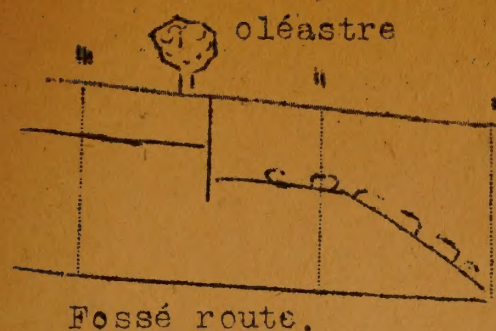
ANALYSE CHIMIQUE en mgr. p.100 de TERRE FINE.

Azote total	p205	Fe libre	Chlorures en Na Cl.	Cations échangeables			
				K	Na	Ca	Mg
122,0	1,5	347,0	11,0	36,5	2,7	1660	24,8

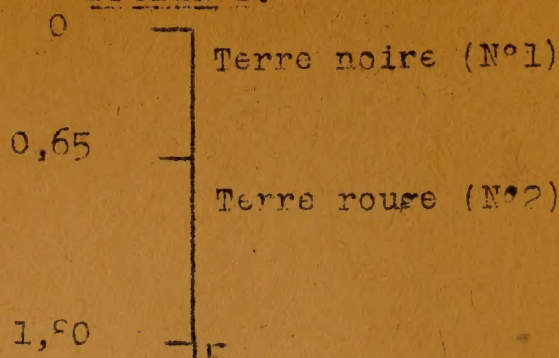
*Dryden 200p
mes 13*



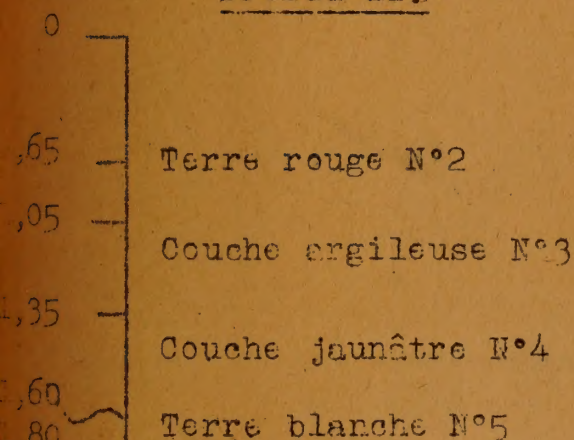
SCHEMA



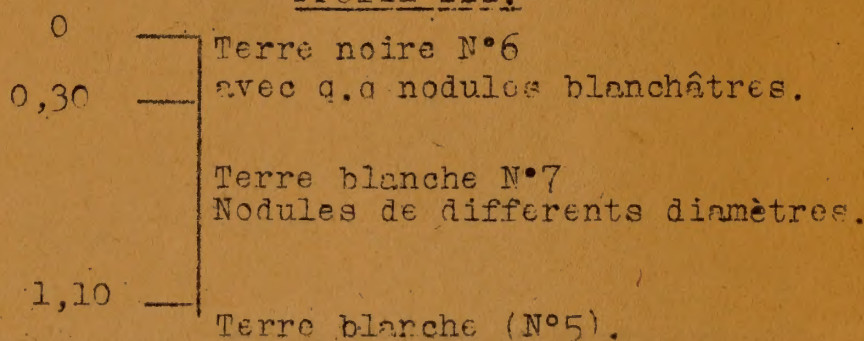
Profil I.-



Profil II.-



Profil III.-



Profil I.-

profil II.-

profil III.-

ANALYSE PHYSIQUE

p.100 de terre fine.

	N°1	N°2	N°1	N°2	N°3	N°4	N°5	N°6	N°7	N°5
p.H.	7,6	7,3	7,6	7,3	7,5	8,1	7,9	7,4	7,5	7,9
Argile	27,9	40,4	27,9	40,4	31,5			26,1		
Limon non calcaire ..	12,0	4,7	12,0	4,7	9,0			14,2		
" calcaire					3,5			6,2		
Sables fins siliceux	45,5	43,0	45,5	43,0	38,5			39,2		
" " calcaires					6,6			2,9		
Sables gros siliceux	7,8	8,0	7,8	8,0	5,5			6,7		
" " calcaires					1,5			0,6		
Calcaire total	6,5	3,8	6,5	3,8	15,0	46,0	85,0	13,5	57,2	85,0
Humus.	0,4	0,1	0,4	0,1	0,3			0,3		
Matière organique ..	5,0	1,2	5,0	1,2	2,6			2,9		

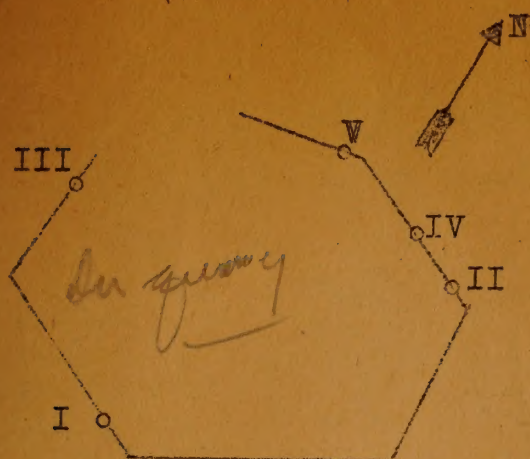
ANALYSE CHIMIQUE

en mgr p.100 de terre fine

	N°1	N°2	N°1	N°2	N°3	N°4	N°5	N°6	N°7	N°5
Azote total	250,0	61,0	250,0	61,0	130,0			147,0		
P2O5 assimilable ...	1,6	1,1	1,6	1,1	7,8			4,0		
Fe libre	125,0	185,0	125,0	185,0	157,0			125,0		
Chlorures en NaCl ..	11	11	11	11	11			18		
Na échang.	3,7	2,5	3,7	2,5	3,3			6,7		
K échang.	64,3	39,1	64,3	39,1	38,5			34,1		
Ca échang.	2370	2150	2370	2150	406			422		
Mg échang.	9,7	12,0	9,7	12,0	18,8			25,1		

ALGER - MAI 1947

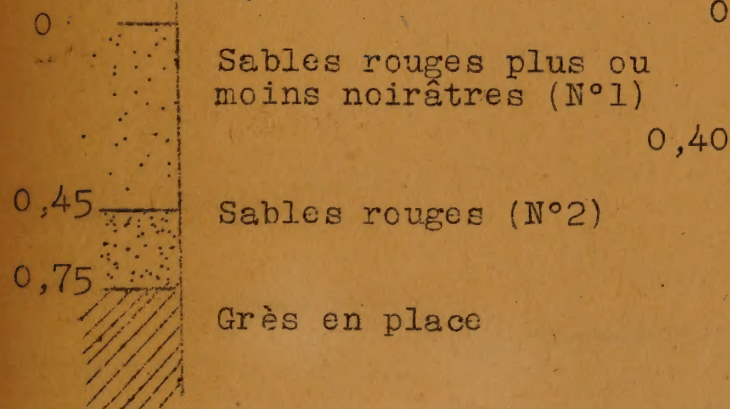
EST-MITIDJA

Carrière d'AIN-TAYA (Zone littorale)
(altitude 29^m)

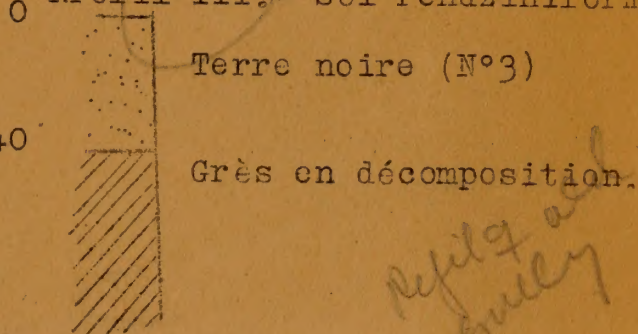
Profil I.



Profil I.-



Profil III.- Sol rendziniforme.



ANALYSE PHYSIQUE % de terre fine

	p.H.	Arg.	limon	S.fins	S.gros.	Calc.	Humus	Matière organique
N° 1	8,2	22,0	9,5	52,5	13,6	2,4	0,1	1,6
N° 2	8,2	30,0	6,8	44,7	17,0	0,9	0,1	2,0
N° 3	8,4	28,4	11,6	42,0	11,4	5,8	0,3	6,0

ANALYSE CHIMIQUE en mgr % de Terre fine

	Azote total	Fe libre	Chlorures (en NaCl)	Cations échangeables K	Na	Ca	Mg
I	79,0	2600	26,6	12,0	19,2	915	20,6
N° 2	98,5	2983	22,2	13,4	25,3	660	42,5
N° 3	296,0	1931	45,0	52,8	22,2	1040	39,0

A _p	0-10"	Brown light sandy clay loam.
A ₃ -G	10-25"	Yellowish calcareous silty clay, mottled a little with white.
G ₂	25-30"	Like the above but more mottled.
C	30-56"†	Dark gray, mottled with light gray and yellow heavy silty clay. Generally massive, but some coarse blocky breakage.

I look at a fourth profile, where I sample on^{ly} the A_p, that is better drained. It lies on the crest of a sharp slope.

Soil sample No. 13 (A_p only)

A _p	0-10"	Reddish-brown sandy clay.
A ₃	10-24"	Yellowish, with slight reddish tinge, brown sandy clay, mottled with light gray; massive and rather compact; easily penetrated by roots.
B ₃ -C	24-56"	Yellowish sandy clay with spots and lenses of slightly reddish sandy gravelly clay.
D	56-70" +	Dark gray, heavy massive clay, mottled with gray and yellow.

In the field the soil has large cracks at the surface 1/4 to 1 inch wide. (See mimeographed French text for some of their notes on these profiles.)

Right now, the oats here look quite good considering the low rainfall. There is some wheat that will yield from 12 to 15 bushels per acre. We drive on to the southeast and soon enter a smooth plain that has been artificially drained. I see potatoes, beans, and other vegetables, including a little maize. These crops are mostly irrigated.

We turn off the road to the right into a very large farm with extensive buildings for handling grapes. There is a large labor force, mostly of Arabs. Here I look at a soil that resembles the shallow phase of Fargo clay, which might be called a chernozemic Wiesenboden, or perhaps an alluvial Wiesenboden with some tendency toward a Chernozem or Rendzina. The land is nearly level and is a good example of the area that was originally marsh which has been drained by the French.

Soil profile sample No. 14

- | | | |
|----------------|----------|---|
| A _p | 0-19" | Very dark gray to nearly black clay. Coarsely prismatic when dry, with some tendency toward very fine blocky. |
| A ₃ | 19-24" | Dark gray clay with a little coarse sand and some gray concretions. |
| C _c | 24-37" | Medium gray clay, mottled with light gray; calcareous. (Light gray when dry.) |
| C | 37-50" + | Massive clay, mottled with yellow and light bluish-gray; the bluish-gray increases with depth. |

The dry surface has wide cracks of 1 to 3 inches. These extend down into the A₃. The cultivated soil is quite cloddy.

Soils about 2 or 3 feet higher than this one are a dull dark grayish-brown at the surface rather than very dark gray.

Much of this soil is devoted to wine grapes to which it appears to me not to be particularly adapted. Many of the leaves are chlorotic, and I suspect it is because of the large amount of lime along with the relatively slow drainage.

Chernozemic Wiesenboden ? Near Est Mitidja, south of Algiers, Algeria

SAMPLE No.	HORIZON	DEPTH	pH	ORGANIC MATTER H ₂ O ₂	SIZE CLASS AND DIAMETER OF PARTICLES (in mm.)							OTHER CLASSES (in mm.)		
					Fine gravel, 2-1	Coarse sand, 1-0.5	Medium sand, 0.5-0.25	Fine sand, 0.25-0.1	Very fine sand, 0.1-0.05	Silt, 0.05-0.002	Clay, <0.002	0.02-0.002	<0.005	>2
		Inches		Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.
No. 14 S47ALgeria-3-1	A _p	0-19	7.9	1.1	0.2	0.6	0.7	3.5	7.2	44.1	43.7	27.7	51.8	0
	A ₃	19-24	8.3	0.8	12.8	4.4	1.2	3.1	5.0	39.0	34.5	26.3	44.1	32
	C _c	24-37	8.2	0.4	10.2	6.9	2.5	4.8	6.6	38.4	30.6	25.0	37.9	20
	C	37-50+	7.9	0.0	0.2	0.5	0.5	2.6	6.1	43.5	46.6	23.9	52.6	< 0.5
3-1	A _p	0-19		% Carbon 1.69										
3-2	A ₃	19-24		.83										
3-3	C _c	24-37		.26										
3-4	C	37-50+		.30										
									Chernozemic Wiesenboden?	-	Near East Mitidja, south of Algiers, Algeria.			



K-1304 May 13, 1947 Algeria. Southeast of Algiers. Landscape of a nearly black soil suggesting a Chernozemic or Rendzina-like Wiesenboden from alluvium. (Resembles shallow Fargo clay of U.S.A.) (Site of sample No. 14.)



K-1305 May 13, 1947 Algeria. Southeast of Algiers. Landscape of a nearly black soil suggesting a Chernozemic or Rendzina-like Wiesenboden from alluvium. (Resembles shallow Fargo clay of U.S.A.)

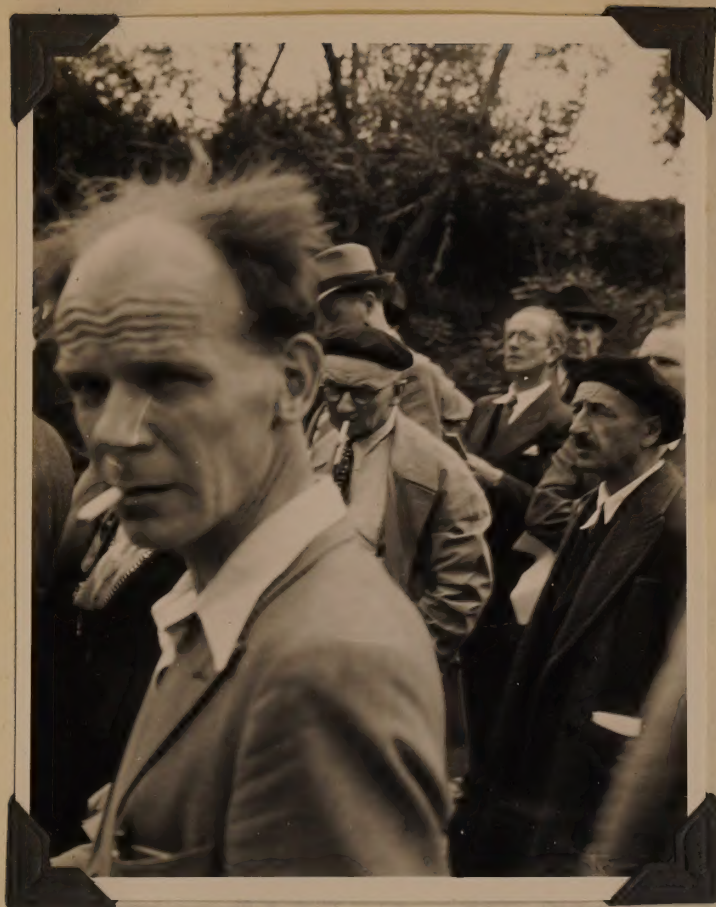
I notice that moldboard plows are not used but instead heavy cultivators pulled by caterpillar tractors. In the farmyard I see some 20-inch subsoilers.

I notice that a large crew is busy near the farmyard making compost from crop residues and animal manures.

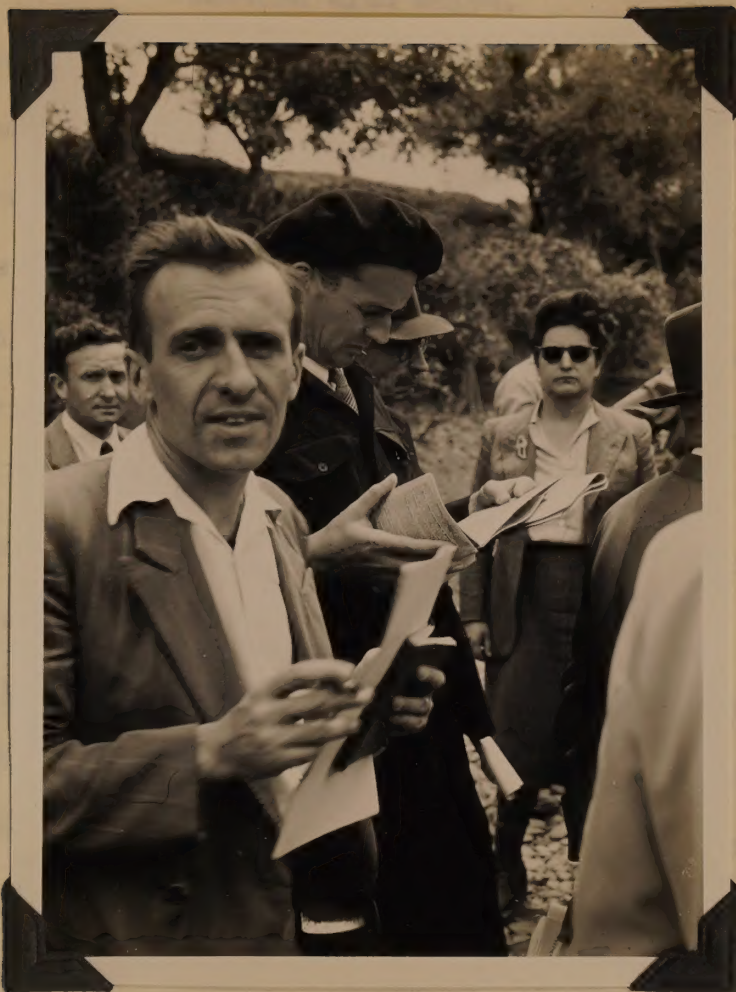
We leave the farm and go back to the main road to Fondouk. The soil along the road is somewhat more brown, and the last profile may represent the lower part of the original plain. The crops are mostly fruits and wine grapes, with some cereals and vegetables. We stop after about 2 kilometers and walk down a wide cobbled artificial ditch made by deepening a former dry run. The drainage ditch is about 25 feet wide and 12 feet deep. It exposes a profile of grayish-brown silty clay alluvium with layers indicating alternate stages of active deposition and of relative stability. The soil in the cuts has a very coarse prismatic structure.

We pass on to the village of Fondouk. I see a little alfalfa, but the main crop is wine grapes with some olives, vegetables, and cereals. The principal soil is a brown, heavy, Alluvial soil. There is some irrigation of gardens, which include onions, sweet potatoes, and other crops, and of little orchards.

The little village is nestled against the mountains, and I look at the soil on the slope just back of the village: (No. 2 on mimeographed sheet furnished by the French.)



K-1306 May 13, 1947
Algeria. Dr. Alex Muir.



K-1307 May 13, 1947
Algeria. Aubert.

- | | | |
|----------------|--------|---|
| A
P | 0-16" | Slightly reddish, brown clay; calcareous material in rather small clods mixed in plowing. |
| A ₃ | 16-30" | Massive yellow silty clay, with some white mottlings. |
| C | 30" + | Massive yellowish silty clay, strongly mottled with white. |

Nearby the soil (No.1 of the guide sheet) has a reddish-brown surface and a reddish-brown sandy clay subsoil (24-48"), with a coarse angular blocky structure.

The soils at this place are badly mixed naturally. In addition, there has been truncation and accumulation over the long period of cultivation. I should call the soil here a complex of Rendzina and Terra Rossa on calcareous alluvium, truncated and overwashed. (The notes furnished by the French seem to be confused.)

We go northeast of this village. The majority of the land is divided between wine grapes and cereals. But there is some irrigated alfalfa, hay, olives, and beans. After about 2 kilometers we pass over a high undulating terrace of reddish-brown soil, and a large amount of irrigated beans, sweet potatoes, and similar crops. A little ways further we pass some native farms on gently rolling land which are mainly in cereals. These farmers seem to be doing a good job. Toward St. Pierre there is an area of soils from stony terrace material. The surface is slightly reddish-brown, and the B horizons are red to reddish-brown. Then again we come to vines on a gently



K-1308 May 13, 1947
Algeria. View east of village of Fondouk.

undulating plain 3 or 4 kilometers north of St. Paul. The soils along the drainageways are gently rolling.

We pass through Régn^ua and go north and northwest. After about 2 kilometers there are less vines and more mixed farming. We approach the south slopes of the high coastal plain. The crops are not very good. Most of the vegetables are protected by cane windbreaks. The soils are reddish-brown and yellowish-brown sandy loams. On the upper plateau I see small intensive vegetable gardens. These are better.

We pass through Surcouf, and then Ain-Tay^ua. Here there are intensive gardens and orchards with beautiful tiny home gardens in the village. We drive to a tavern by the seashore for a drink of aniseed. At 1 o'clock there is another gay lunch with pretty speeches. (Frequently this morning there is a great deal of side discussion as to whether or not the Mediterranean red soil (Terra Rossa) is a normal feature of the present environment, or whether it is fossil from an older environment.)

We rise from lunch at 3 o'clock and then go west and southwest along the bay. At first the crops are largely vegetables and cereals. We stop at a very old quarry on a hill near the sea $1\frac{1}{2}$ kilometers west of Ain Tay^ua. The rocks are apparently calcareous sandstones. I judge that the area has been severely truncated and refilled from time to time.

Terra Rossa and very dark gray Rendzina soils have developed. The whole soil area has been moved around and isn't typical of anything.

Near Cap Matifou some of the land on gentle slopes is used for pasture. The cows are poor. Vegetables are grown in little plots with cane windbreaks. These include sweet corn, many beans, potatoes, and sweet potatoes. As we approach Algiers the gardening is very intensive. Some of the crops are grown in terraced beds on slopes. The soil is a bright reddish-brown sandy loam as we pass the suburbs of Algiers and take the road to Birkadem. On the rolling land back of Algiers there is mixed farming and wine grapes. Near Birkadem there are more vines and the vegetables drop out until we get close to the village where fruits and vegetables reappear. The soils are rolling reddish-brown heavy loams or sandy clay loams, I suspect.

We stop to look at a profile near the edge of Birkadem where there has been considerable disturbance. The surface 12 inches is a bright reddish-brown sandy loam. Beneath it is a rather bright reddish-brown sandy loam over yellowish-gray calcareous limestone.

This profile is perched on a cliff in a place where it is nearly impossible to get at it. Beneath the cliff there is an interesting field of bright reddish-brown soil in wine grapes.

CONFERENCE DE PEDOLOGIE MEDITERRANEENNE

ALGER - MAI 1947

S A H E L

- La Pinède près de KOUBA- (altitude 70m)

0	
0,20	Terre arable: sables noirâtres (N°1)
0,50	Roche mère: terre rouge (N°2)
0,90	Terre rouge (N°3)
1,15	Dalle calcaire de 3 m/m d'épaisseur. Sables clairs (N°4).

ANALYSE PHYSIQUE (% de terre fine)

	N° 1	N° 2	N° 3	N° 4
p.H.	8,2	7,8	7,8	8,3
Argile	22,5	46,9	54,0	2,98
Calcaire colloïdal	2,75			1,67
Limon calcaire	11,35			1,66
Limon siliceux	11,9	9,6	7,3	2,84
Sables fins calcaires	9,6			23,5
Sables fins siliceux	22,12	23,2	31,6	61,5
Sables grossiers calcaires	4,0			2,2
Sables grossiers siliceux	10,73	8,3	5,5	3,4
Calcaire total	27,7	1,9	1,4	28,9
Humus		0,16	0,1	
Matière organique	2,7	1,7		0,2

ANALYSE CHIMIQUE (en mg % de terre fine.)

	N° 1	N° 2	N° 3	N° 4
Azote total	134,5	87,4		12,6
Fer libre	2.178	3091	1573	1355
Fer total	2583	3766	3983	2065
Chlorures (en NaCl)	33,6	22,4	22,2	
Cations échangeables : K	33,0	18,6	20,0	
Na	29,1	13,5	41,3	
Ca	379	954	801	
Mg	31,5	19,0	37,0	

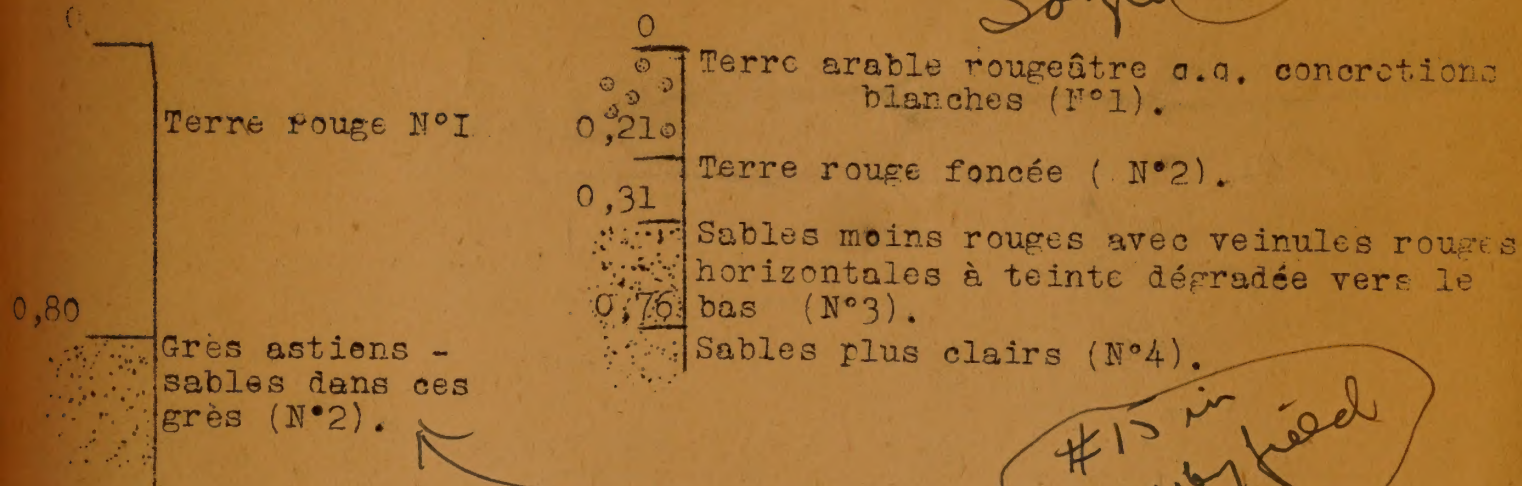
ALGER - MAI 1947.

S A H E L

- PROFILS DE BIRKADEM -

I - Profil propriété SCOTTI.

II - Profil de la carrière (paroi Ouest).



ANALYSE PHYSIQUE (p.100 de terre fine).

	p.H.	Arg.	Limon	S.fins	S.gr.	Calc. total	Humus	mat. org.
Profil I.- N°1	8,1	28,1	3,1	62,5	3,9	1,4	0,1	1,1
Profil II.- N°1	8,4	26,4	7,3	55,1	6,3	3,9		1,7
N°2	7,7	28,5	5,2	63,0	3,3	0,0		
N°3	7,4	11,2	3,0	80,8	5,0	0,0		
N°4	6,5	5,4	3,3	84,0	7,0	0,0		

ANALYSE CHIMIQUE (en mgr. p.100 de terre fine).

	Azote total	Fe libre	Fe chlorures total	Cations échangeables (en Na Cl)	K	Na	Ca	Mg
Profil I.- N°1	56,8	650,0	2716	28,0	36,2	19,9	623	29,3
N°2		762,0	1561					
Profil II.- N°1	84,5	255,0	1981					
N°2	51,3	277,0	1981					
N°3		220,5	1596					
N°4		117,8	1386					

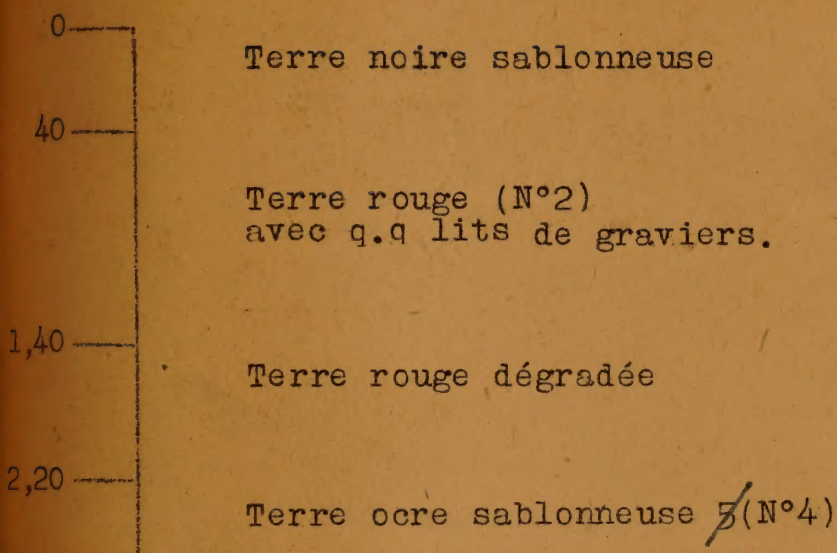
La paroi Nord de la Carrière de BIRKADEM présente des Poches de sables blanc.

CONFERENCE DE PEDOLOGIE MEDITERRANEENNE

ALGER - MAI 1947

"Carrière" de DRARIA (528,0-380,4)
Altitude : 185 m.

Profil



ANALYSE PHYSIQUE (% de terre fine)

	pH	terre : fine %	Arg.	Limon:	S.fins:	S.gros:	Calc.	Humus:	Mat. org.
N° 1	7,0	99,9	26,1	13,1	57,5	2,2	0	0,3	
N° 2	6,1	97,2	37,0	6,0	55,0	1,8	0	0,2	0,8
N° 3	6,8	100	20,2	4,3	74,3	0,4	0	0,1	
N° 4	6,8	100	9,1	4,9	84,0	1,2	0	0,1	0,2

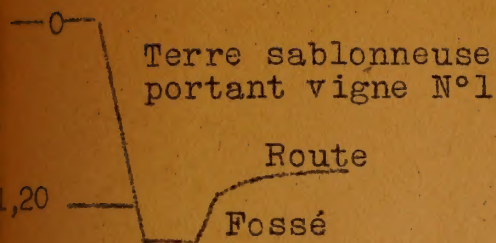
ANALYSE CHIMIQUE (en mgr % de terre fine).

	Azote : total	Fe : libre	Chlorures : (en NaCl)	Cations échangeables			
				K	Na	Ca	Mg
N° 1		2.705		24,3	1,5	339	94,4
N° 2	41,7	1.188	33,9	13,0	27,1	215	21,5
N° 3		2.895		12,8	3,1	197	39,6
N° 4	9,8	594	28,0	7,5	27,1	175	11,1

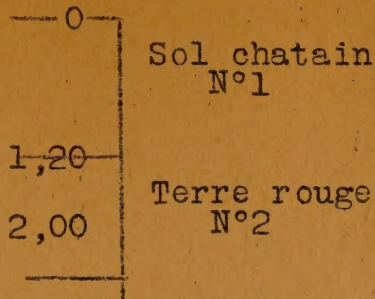
ALGER - MAI 1947

D R A R I A
(Altitude moy. 185 m.)

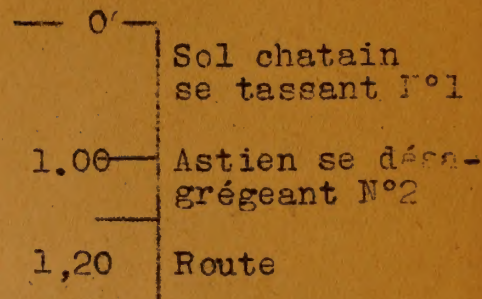
Profil I



Profil II.



Profil III.



ANALYSE PHYSIQUE (% de terre fine)

Profils :		pH :	Terre :	Arg. :	Limor :	S. fins :	S. gr. :	Calc. :	Humus :	Mat. :
			fine % :							org :
I.-	N°1 :	7,4 :	99,7 :	19,5 :	13,6 :	63,0 :	2,7 :	1,1 :	0,1 :	0,7 :
II.-	N°1 :	7,2 :	98,7 :	18,4 :	9,1 :	66,0 :	3,6 :	2,6 :	0,1 :	1,2 :
	N°2 :	6,9 :	99,8 :	39,5 :	11,1 :	46,4 :	3,1 :	0 :	0,1 :	0,6 :
III.-	N°1 :	8,0 :	84,6 :	23,5 :	10,5 :	46,0 :	3,0 :	15,4 :	0,1 :	0,6 :
	N°2 :	8,2 :	77,3 :					45,4 :		

ANALYSE CHIMIQUE (en mgr % de terre fine)

Profils :		Azote :	Fe :	Fe :	Chlor. :	Cations échangeables			
		total :	libre :	total :	en NaCl :	K :	Na :	Ca :	Mg :
I.-	N°1 :	34,8 :	1468 :	2104 :	34,0 :	15,3 :	20,0 :	526 :	29,3 :
II.-	N°1 :	62,5 :	1573 :	2104 :	34,0 :	77,0 :	24,7 :	985 :	12,7 :
	N°2 :	29,2 :	1931 :	3255 :	34,0 :	35,0 :	25,5 :	390 :	29,8 :
III.-	N°1 :	32,0 :	3315 :	3395 :	28,0 :	22,0 :	23,1 :	252 :	22,2 :
	N°2 :		2788 :						

COMMENTAIRES.-

Formation des terres rouges et ocres du Sahel (BIRKADEM et DRARIA)

La roche originelle est la mollasse de l'Astien (N°2/III). La décomposition de cette mollasse se ferait suivant le processus:

1°) désagrégation et décalcification donnant les terres 1/III.

2°) décalcification plus poussée et rubéfaction conduisant aux terres 2/II.

La terre 1/II qui est au-dessus de l'horizon 2/II provient d'une décomposition postérieure de la roche originelle 2/III et d'un transport sur 2/II.

Donc dans le profil II - l'horizon 2 n'est pas la roche mère qui a fourni l'horizon 1 - Ce dernier horizon résulte d'un recouvrement par transport.

altitude : 130 "

P L A N.



Maison

Sample 17 here
Nat 6'

weeds around coast
slow variation in texture,
color, but to yellow,
and stability of
weeds

Coupe du talus en I. - Le dépôt de l'Astien est très gréseux en profondeur, moins vers la surface et présente de nombreux fossiles: pecten, ostrea.

Ordre chronologique: il y a eu dépôt de l'Astien puis regression marine et régime continental, puis phénomène de glyptogénèse en II, III, IV qui enlève l'astien par érosion. Il y a ensuite remplissage d'abord en II très probablement, puis en IV et finalement en III.

Gradation des teintes : IV - Sables rouges.

II - " moins rouges que IV.

III - " clairs.

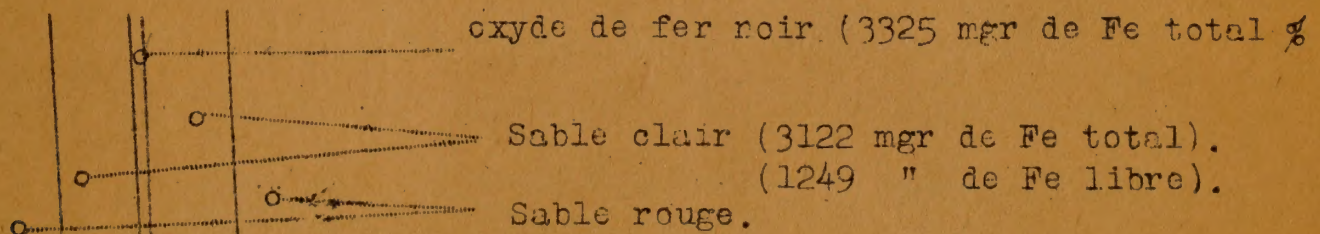
La zone II se présente avec 2 horizons ; en profondeur une couche rouge II a probablement synchrone de IV mais présentant avec IV quelques différences :

	II/a	IV
Zones à oxyde de fer noir :	non	oui
poches de sable clair.	non	oui

ZONE III. - Il existe un amas sableux plus ou moins consolidé en grès à 3m de profondeur à partir de la surface naturelle du terrain.

A un mètre à droite et à la même profondeur, se trouve une partie également consolidée mais plus rubéfiée.

ZONE IV. - Terres très rouges avec en profondeur des filons minces d'oxyde de fer noir (quelques m/m d'épaisseur) avec de chaque côté des zones sableuses plus claires.



Ces sables clairs semblent localisés tout le long des fissures ou bien encore en revêtements plus ou moins verticaux de chaque côté des filons d'oxyde de fer noir.

De temps en temps dans les sables rouges des nodules ferrugineux (3.458 mgr Fe total).

Ce sable clair présentant une teneur en fer identique à celui du filon foncé - laisse présumer que sa teinte claire résulte d'une réduction des sels de fer par l'eau circulant dans une fissure ou par les racines. Puis il y a eu ultérieurement remplissage de cette fissure par de l'oxyde de fer.

Ce phénomène se retrouve fréquemment dans toute la zone IV alors que les autres zones n'y ont pas été soumises. Cela résulte sans doute de conditions différentes: circulation de l'eau ou époque de formation.

I take a sample of the surface of this as sample No. 15.

(Red when dry.) The surface soil is cloddy. The field had been terraced mostly in the form of earth benches. The land has likely been farmed for a very long time and may have had some erosion.

We go over to the other side of the village and see another disturbed profile of sandy Terra Rossa on about 6 percent slope.

Soil profile sample No. 16

A _p	0-10"	Brittle and crumbly reddish-brown loam. (Red when dry.)
B ₂	10-17"	Massive, bright reddish-brown sandy loam. (Red when dry.)
B ₃	17-29"	Transitional, lighter in color. (Red loamy fine sand when dry.)
C	29-46" +	Reddish-yellow fine sand from limestone.
D		Irregularly weathered pinkish-gray decalcified calcareous sandstone.

The thickness of the A_p and the total depth of the solum are quite irregular.

On the lower slope I notice that the B is heavier in clay and more moist. In great haste I collect a special sample of this red B where the soil is a little heavier -- a fine sandy clay loam.

We drive on and then stop nearby at a place called Saoula and look at a big excavation at a somewhat similar soil

SAMPLE No.	HORIZON	DEPTH	pH	ORGANIC MATTER by H ₂ O ₂	SIZE CLASS AND DIAMETER OF PARTICLES (in mm.)							OTHER CLASSES (in mm.)			
					Fine gravel, 2-1	Coarse sand, 1-0.5	Medium sand, 0.5-0.25	Fine sand, 0.25-0.1	Very fine sand, 0.1-0.05	Silt, 0.05-0.002	Clay, ≤0.002	0.02-0.002	≤0.005	>2	
No. 16															
S47	Algeria-5-1	Ap	0-10	7.9	0.8	1.0	1.4	3.2	54.4	3.3	10.4	26.3	7.3	28.8	4
5-2	B ₂	10-17	8.0	0.1	0.2	0.5	0.5	1.5	58.1	2.2	7.7	29.8	5.7	29.9	<0.5
5-3	B ₃	17-29	7.8	0.0	0.0	0.1	0.1	2.4	82.5	1.6	3.5	9.9	2.6	12.0	0
5-4	C	29-46	7.8	0.0	0.0	0.0	0.0	0.5	90.1	2.2	4.5	2.7	3.5	5.6	<0.5
5-2X	Special sample of B ₂ on lower slope		7.0	0.0	0.5	0.6	1.1	47.6	5.6	11.2	33.4	6.8	35.4	<0.5	
5-2	B ₂	10-17													
5-2X	Special														
5-5	A sandy limestone - about 1/3 large grains of quartz and 2/3 carbonate. Probably appreciable MgCO ₃ or (CaMg)CO ₃ . Smaller amounts of clay mineral aggregates and iron oxide.														
Sandy Terra Rossa - Near Birkadem, Algeria.															

Thermal Analysis

Peak Temp.

Kaolinite

565

10-17

B₂

Special

562

28%

30%

Clay

29.8%

33.4%

Sandy Terra Rossa - Near

Birkadem, Algeria.

higher in clay content. The color and depths of horizons are extremely variable. I collect a sample of the red clay at about 6 feet:

Sample No. 17: massive clay with stains of manganese and iron.

I take pictures of the bench terraces in a cultivated field nearby. The soil in this field is coarser, cloddy, and not very erosive. The slope is about 8 percent. The field is planted to fruits and vegetables, not too neatly.

We leave Saoula and drive west, first over rolling terraced Terra Rossa with wine grapes, fruits, vegetables, and cereals. Some hillsides are very beautiful and exceedingly well kept. We pass Drairia where the land is again devoted largely to wine grapes. In many of the vineyards the young growing stems are tied down over the top of the plant.

We pass El-Achour. Here the land is strongly rolling. Much of it is devoted to hay and some to cereals. There are good patches of wheat that might run up to 25 bushels to the acre, and some fairly good barley. I suspect this heavy, dark gray soil is a Rendzina.

About 7 kilometers we pass this soil and see browner soils with vines.

All around me I hear a great deal of speculation about the origin of these soils. Certainly there are few hard facts to go on. Some even raise the question as to whether or not loess

Terra Rossa

Near Saoula, Algeria

SAMPLE No.	HORIZON	DEPTH	pH	ORGANIC MATTER by H ₂ O ₂	SIZE CLASS AND DIAMETER OF PARTICLES (in mm.)							OTHER CLASSES (in mm.)		
					Fine gravel, 2-1	Coarse sand, 1-0.5	Medium sand, 0.5-0.25	Fine sand, 0.25-0.1	Very fine sand, 0.1-0.05	Silt, 0.05-0.002	Clay, 0.002	0.02-0.002	<0.005	>2
No. 17	B	At 6 feet	6.8	0.1	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.
					0.4	2.7	2.9	34.1	7.2	21.9	30.8	14.2	36.4	<0.5
6-1	B	At 6 feet		560	<u>Thermal Analysis</u>							Terra Rossa - Near Saoula, Algeria		
					<u>Peak temp.</u>		<u>Kaolinite</u>		<u>Clay</u>					
						27%		30.8%						

of some sort is not parent material for all of the Mediterranean red soils!

For a way toward la Trappe we go along the boundary between the gray soils and reddish-brown soils. About 4 kilometers from la Trappe we are back on undulating red soils devoted mostly to vines. Near this village we see again the sandy red soil, which is carefully terraced and used for vegetables in small fields.

About 6:45 we pass Staoueli. It is now dusk and I am very tired. We drive along the road not far from the sea. For a short distance we see sand dunes with little vegetable gardens wherever they are possible. We stop to look at a very sandy, but compact, very red soil now covered with wind-blown sand. But it is too dark to see much. All this extra driving simply to see a fossil "Red" soil covered with dune sand!

We drive back to Algiers along the sea. There are many nice homes in the narrow space between the road and the low cliffs of the shore. I am back at the hotel about 7:45. Certainly I would give a good deal for a pitcher of real American ice water! I have a slow dinner at 8 and go directly to bed.

Emile H. DEL VILLAR

Président de la S/ Commission Méditerranéenne de l'Association
Internationale de la Science du Sol

en Mission à l'Institut Scientifique Chérifien, RABAT

à la

REUNION INTERNATIONALE DE PEDOLOGIE MEDITERRANEENNE

de MONTPELLIER-ALGER (1947)

Très honorés collègues,

Dans le programme des séances à MONTPELLIER, auxquelles mes devoirs en AFRIQUE m'empêchent d'assister, j'ai vu deux conférences sur Cartographie des sols; l'une de M. PRASSOLOV sur les sols du Monde, l'autre de M. KELLOG sur les sols des ETATS-UNIS. Il peut étonner que, cette réunion s'intitulant "Méditerranéenne", le Programme ne contienne aucun numéro se rapportant aux nombreux travaux de classification et cartographie des sols méditerranéens, que nous avons accomplis comme Président d'une organisation méditerranéenne internationale. La première invitation à participer à ce Congrès m'est parvenue d'ALGER, à RABAT, le 12 Janvier, accompagnée d'une lettre de M. le Secrétaire, fixant au 15 du même mois la date finale de réception des travaux à ALGER. Ceci explique le caractère posthume et d'initiative privée de cette communication.

Le fonctionnement de l'Association Internationale de la Science du Sol a été interrompu par la guerre, mais je ne sais pas qu'elle ait été dissoute. Or, malgré les horreurs de ces dernières années, depuis 1936 dans mon pays et depuis 1939 dans le reste du monde, ma Sous-Commission méditerranéenne a continué à travailler activement sans interruption; et comme président de celle-ci j'ai eu le précieux concours de ses collaborateurs les plus constants, notamment, pour l'Afrique du Nord, l'Ingénieur en Chef du Génie Rural, M. Georges CARLE (+ 1945), et pour l'Afrique et la Péninsule Luso-Ibérique l'ancien laboratoire de notre regretté collègue, Dr. DE SIGMOND à BUDAPEST, dirigé après sa mort par le Dr. KOTZMANN.

Je crois donc avoir le droit et le devoir de rendre compte à cette réunion des travaux pédologiques méditerranéens accomplis par moi dans ces conditions depuis le congrès d'OXFORD en 1935, en partie publiés et en partie inédits à cause des difficultés de publication survenues avec la guerre et pas encore disparues. En voici la liste :

- TRAVAUX PUBLIES OU EN PUBLICATION :

"Sobre la adaptacion de Pinus Pinaster a suelos salizos"
Bull. Silva Mediterranea, V, XIII, 1935.

"Rapports entre l'eau souterraine et la typologie des sols"
Bull. Comité p. l'étude des eaux souterraines du MAROC, 1937.

"Soils of the Lusitane-Iberian Peninsula" - en espagnol et en anglais, MADRID 1937.

"Carte des sols de la Péninsule Luso-Ibérique" E = 1: 1.500.000;
en espagnol, français, anglais et allemand, LONDRES, Th. Murby
& Co, 1938.

"Les sols du MAROC au point de vue géographique" Revue de Géographie marocaine, 1938, I, II.

"A new contribution to a universal objective classification of soils". Soil Research V, 4/5 1939.

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Communications à la Société des Sc. nat. du MAROC, C.r. des Séances 1937 à 1946 (en partie pédologiques, en partie botaniques).

"Types de sol de l'Afrique du Nord" : en publication par livraisons; le fascicule I paraissant à la date de cette conférence internationale : 1947.

TRAVAUX INEDITS.

"Types de sol du GHARB : leurs rapports génétiques" rédigé par l'Assoc. maroc. pour l'étude du sol : 1940.

"Carte des sols du SAHEL d'ALGER et d'une partie de la Mitidja, etc..." E = 1 : 50.000.

"Carte des sols de la région d'ORAN-MOSTAGANEM" E = 1 : 50.000.

"Mémoire sur les sols du GHARB oriental" rédigé sur commande de la Direction de la Production agricole du MAROC. 1942.

"Carte des sols du GHARB Français" E = 1 : 50.000, en couleurs, plusieurs feuilles, avec fichier descriptif des profils prélevés (plus de 100) et chiffres d'analyse. Travail accompli pour la Chambre d'Agriculture de RABAT. 1943.

"Carte des sols de la région de RABAT" E = 1 : 50.000, en couleurs, plusieurs feuilles. Id. 1943.

"Nouvelle carte des sols du GHARB" E = 1 : 100.000.
A l'Institut Scientifique Chérifien de RABAT. 1945.

"Carte des sols du MAROC" E = 1 : 1.500.000. En train d'être terminée. 1934-1937.

Cette liste représente l'état de la collaboration de ma Sous-Commission méditerranéenne au problème de la connaissance des sols du Globe et de leur cartographie.

La cartographie des sols n'étant que l'expression graphique de la distribution de leurs différents types, avant le problème de la cartographie se pose celui de la classification, qui est loin d'être résolu à goût de tous. Mais, la classification des sols étant un thème scientifique objectif, pour les travaux personnels on doit respecter la liberté de chaque auteur d'adopter la méthode à laquelle sa pensée et ses recherches l'ont conduit. La science est un processus indéfini et personne n'a le droit de mettre une limite à son évolution.

Lorsqu'il s'agit d'un travail collectif, il est évident qu'il faut bien adopter une méthode uniforme. Mais celle-ci reste toujours exposée à la critique scientifique universelle, comme tout ce qui est matière à opiner.

L'adoption d'une classification en vue d'une carte des sols du Monde, n'est pas sujet à résoudre dans une séance entre un petit nombre de pédologues ayant chacun son parti pris ou son choix individuel. Elle ne peut être que le résultat d'une collaboration internationale la plus large possible. Pour ce but et d'autres analogues, il existait déjà la V^e Commission de l'Association Internationale de la Science du Sol, divisée en sous-commissions pour les différentes parties du Monde. Cette Commission doit se refaire, et c'est sur le rapport définitif de chaque sous-commission, qu'un accord conscient et solide de la V^e Commission peut être établi.

Pour ma part, comme Président que j'ai été nommé au Congrès de 1930 de la S/Commission Méditerranéenne, la tâche est terminée. Et je peux rendre compte de la classification où j'ai été conduit par mon étude des Pays méditerranéens, mais qui est aussi universelle.

Cette classification a évolué en dedans de mon propre travail, à la recherche d'une perfection toujours plus grande, mais en restant la même dans l'essentiel. Elle se trouve publiée surtout dans les endroits ci-dessous :

Dans les "Proceedings" du Deuxième congrès International des Sols (LENINGRAD-MOSCOU, 1930).

Dans le premier chapitre de mon ouvrage cité "Soils of the Lusitane-Iberian Peninsula", 1937.

Dans la revue "Soil Research" VI, 4/5, 1939.

Dans le premier fascicule, chap. I de mon ouvrage en publication "Types de sol de l'Afrique du Nord", 1947.

Lorsque les Présidents de toutes les autres sous-commissions de la commission V auront exposé analogiquement la méthode qu'ils ont choisie ou créée, et appliqué avec succès à la région respective du Globe, on aura la base scientifique pour comparer ces différentes méthodes et en arriver à une méthode unique applicable à un travail collectif pour la carte du Monde.

Pour l'EUROPE, on pourrait prendre comme méthode élaborée et appliquée, celle utilisée par Stremme dans la Carte générale de l'EUROPE dressée sous sa direction, en tenant compte aussi de la méthode élaborée par M. OUDIN pour la carte de la FRANCE, et qui est applicable en outre à une grande partie de l'EUROPE.

Pour le domaine eur-asiatique de l'U.R.S.S., je suppose que la conférence de M. PRASSOLOV nous indiquera l'état actuel du sujet.

Pour l'Amérique du Nord, on connaît la carte des sols des ETATS-UNIS, dressée sous la direction de notre regretté collègue M. MARBUT, et c'est à M. KELLOG de nous apprendre l'état actuel de la question.

Pour le reste du Globe, peut-être la conférence de M. PRASSOLOV nous fournira aussi des renseignements. Des travaux très importants nous sont connus sur quelques pays, par exemple la CHINE et le JAPON. Mais il est évident qu'il reste des étendues immenses de la surface terrestre pour lesquelles nous ne sommes pas encore dûment documentés. Il faudra attendre les expositions des présidents des sous-commissions respectives.

Entre temps la V Commission pourrait travailler à réunir, sur la base du travail accompli par chaque sous-commission, un fichier universel de sols, base la plus rationnelle pour arriver à la classification mondiale, consciente et solide dont il s'agit.

Seulement, les conditions actuelles du Monde, avec toutes sortes d'entraves de frontières, même chez les pays se vantant le plus d'avoir un régime de liberté, et avec des difficultés presque insurmontables pour faire des publications, sont incompatibles avec une collaboration internationale intensive en vue d'une carte pédologique mondiale. Il faut que cette réunion commence par proclamer le besoin, au-dessus de toutes les luttes de la politique, d'une liberté intégrale effective pour la vie scientifique, dont l'activité ne se manifeste pas par des luttes, mais par la collaboration dans le culte de la vérité.

RABAT, le 20 Mars 1947



K-1309 May 13, 1947
Algeria. Near Saoula. View of bench terraces
on Terra Rossa soil near site of sample No. 17.



Group picture of part of members of Conference in Algiers.
(I am at the dentist's office.)

May 14: In Algiers

First in the morning I change some money and do a little essential shopping. Then I go to the discussions at the University.

A great deal of the discussion is about the Mediterranean Red soils (Terra Rossa). Some maintain they are fossil soils; others think they are developed from loess or some other material in a previous climatic age. The assumption seems to be that some one process accounts for all of them. This I doubt. I suspect that the previous geological history of the rocks is often relevant. The nature of the rock is important: some kinds give Rendzina, other kinds give Terra Rossa. I feel definitely that soil No. 16 has developed from rock fairly recently. Del Villar seems to think that most Terra Rossa is fossil, but not of the same age. He emphasizes the importance of archaeology to establish their age. I think this would be harder to do than he indicates.

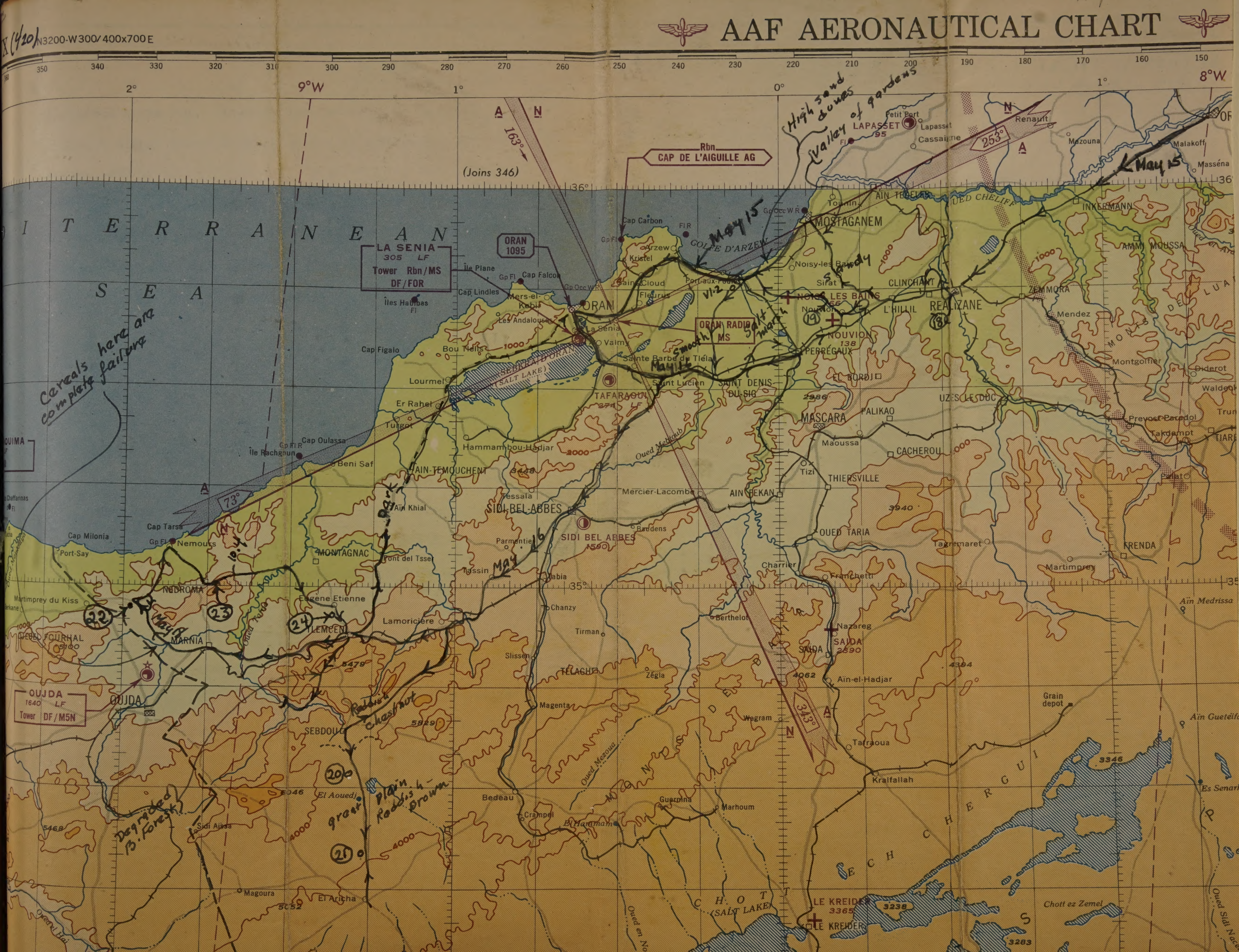
If the soil scientists concerned with Terra Rossa were to spend a part of the time they use for elaborate speculation in careful field studies to determine the morphology more accurately and to establish the relationships of the present environment and geological formations to the several morphological varieties, they might solve the problem rather easily.

M. Geze says that he finds old soils either at the surface or buried. He seems to doubt that Terra Rossa is now forming in this region. He seems to think that the normal soils in the present environment are brown not red. He points out that the two could only be separated on very small scale maps. Thus he objects to considering Terra Rossa as the zonal soil of the Mediterranean region. He asserts that the distribution between the brown soils and the "Red" soils (Terra Rossa) is very important to agriculture. I ask him repeatedly for at least one specific example of any important difference that would support his assertion. He cannot give even one! (He doesn't know the soils, I suspect.)

Bramao says that in Portugal the "Red" soils (Terra Rossa) require more phosphorus fertilization than the associated brown soils.

Near the end of the conference Aubert presents a long paper on the general distribution of soils in Senegal.

I return to the hotel after lunch and attempt to make arrangements for future travel back to Paris. At 2 o'clock I go to the dentist and he completes the filling of my tooth. Later in the afternoon I complete the wrapping of my soil samples. I have an early dinner and early to bed for the trip tomorrow.



AAF AERONAUTICAL CHART



X (410) N3200-W300/400x700E



Cereals here are complete failure

High sand dunes valley of gardens

May 15

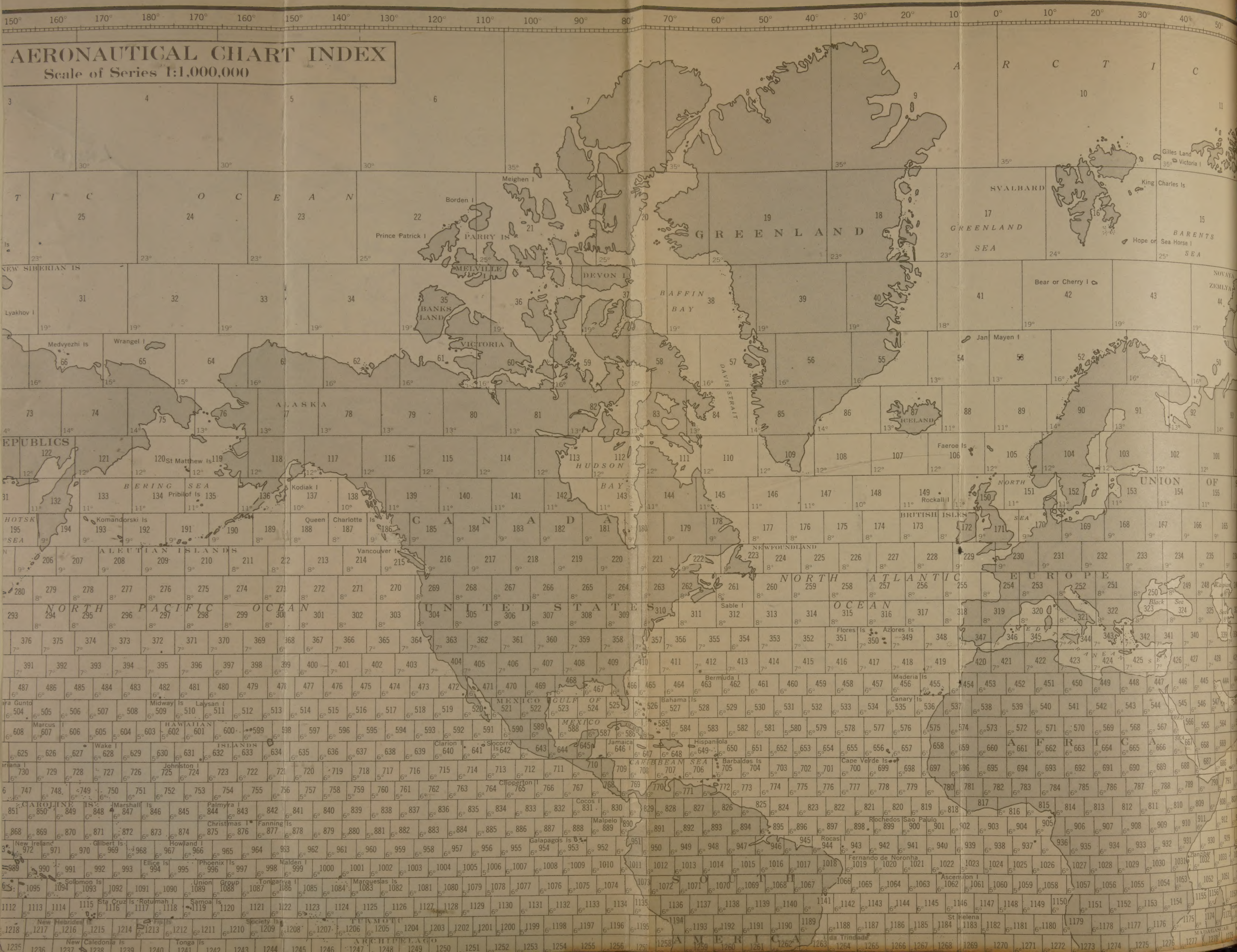
May 15

May 15

Degraded B. Forest

great Plain reddish brown

Chastrot



north are quite dry. There is some crude strip cropping but most slopes above 50-60 percent have small trees and shrubs.

The valley our train is following becomes narrower and we pass through several tunnels. On south-facing slopes I see bad erosion. Many beautiful oleander bushes grow in the wild land along the roads and in the dry runs.

We pass Bou Medfa in rolling country with grayish-brown soil used largely for cereals and vines. The cereals here look fair. Some of the rolling land is rather choppy with grayish-brown soil from soft rocks. This is mostly in fallow and cereals.

After passing Vesoul-Benian we see some hilly land and the black tents of the nomads. The crops are cereals, vines, and olives. Many of the slopes are used for pasture. The soil is a rather dark gray and is developed, I suspect, from soft calcareous rocks. Although the soil seems to slump easily in the cuts, the surface erosion is not serious.

Beyond Miliana Margueritte station the land is hilly and the agriculture is mixed. There is considerable shrubby pasture and wasteland. The grayish-brown soils are developed from soft shales or clay rock. We pass through some deeply dissected gorges with a good cover of shrubs.

We come to a great plain which extends to the south-east, and stop at Affreville. This is a fair-sized town. There are a great many poor-looking rectangular adobe houses for the Arabs. This area is quite dry, and it is said that one may have a crop only once in four or five years without irrigation. The cereals here now are short and thin. This great plain extends some 20 miles at least to the south and southeast.

I travel very comfortably in a nice clean car, with Muir, Bramao, Pendleton, and Watt.

Beyond Affreville, the upper terraces have dark reddish-brown soil with grain, fallow, olives, and grapes. The soils in the plain to the south are probably chernozemic Wiesenboden or dark Rendzina-like Alluvials similar to sample No. 14. The railway goes along between the high terraces and fans on the north side of the valley and the original swampy plain. Beyond Littre the soils are strong reddish-brown with a high percentage of cereals. As we go west, this plain becomes even more nearly level. Some of the soil is artificially drained. Generally, cereals are poor but some fields are fair -- about 12 to 20 bushels of wheat per acre.

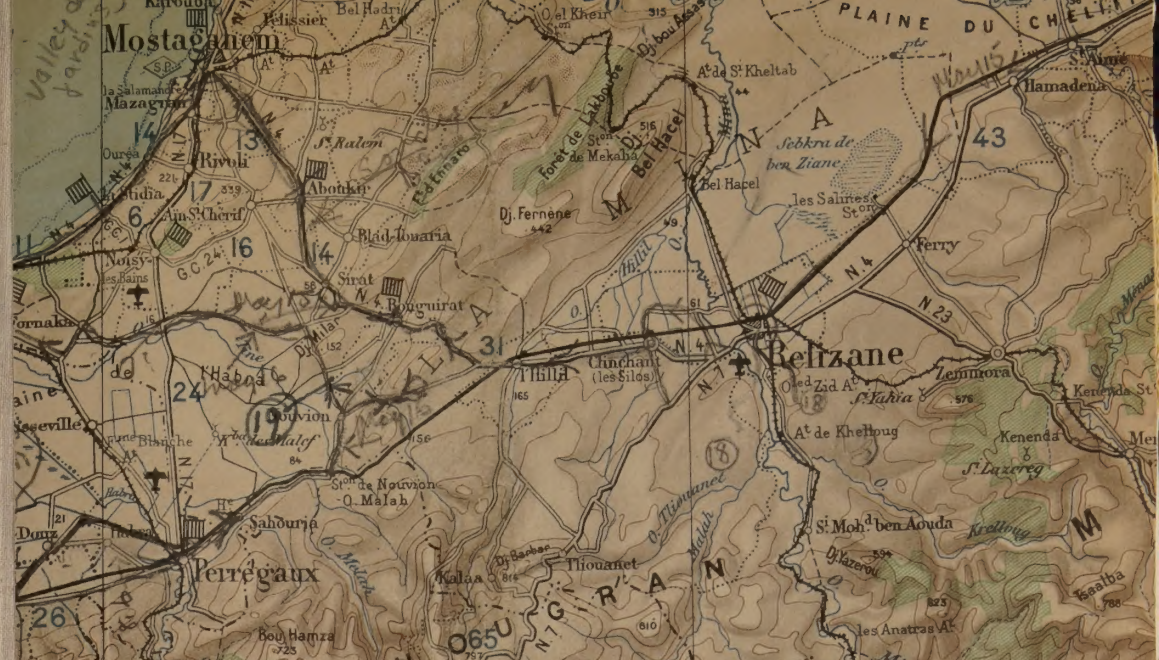
At Qued Fodda there is still dark reddish-brown soil with mixed crops. This is better country than I had expected. I see olives and many kinds of fruits, including pomegranates and apricots. Toward Orleansville I see a few



K-1310 May 15, 1947
Algeria. West of Affreville. Native farmstead on
reddish-brown soil.



K-1311 May 15, 1947
Algeria. 2 kilometers west of LeMerdja. Large farm,
mostly cereals, with wheat of 6 to 10 bushels per acre.



irrigated orchards of citrus and other fruits, and, a little later, irrigated alfalfa, vegetables, and fruits. From the train, this soil resembles a Chestnut soil on a terrace. There are very few houses in the plains and laborers in the fields must walk long distances from the villages.

Near Malakoff there are some irrigated cereals, as well as citrus and other fruits. These are grown on a nearly flat, dull brown Alluvial soil. We are soon back on reddish-brown soil where the crops are mostly poor cereals, with fallow and hay.

Beyond Le Merdja the soil is cobbly at shallow depths and the proportion of pasture is high. About 2 kilometers beyond this village I see a good deal of cereal. The quality of the grain varies a good deal. Wheat might run 6 to 10 bushels per acre, and barley 3 to 15. Often olives are irrigated and sometimes cereal.^{1/} Along here we also see large bales of bark from the cork trees piled near the station.

Near St. Aime I see beautiful rows of irrigated olives. Some of the olives have cereal underneath and a few alfalfa. Beyond, I see large fields of unirrigated wheat that will likely run about 3 bushels to the acre.

^{1/} Before starting on the trip in Algeria the French explained that neither cereal nor olives were irrigated in the country!!

As the railway turns more southwest toward Relizane there are many nearly barren pasture lands, as well as fields of nearly worthless barley. Just before coming to the city the railroad crosses a large salt marsh.

We reach Relizane about 1:15 and have a considerable delay before the busses come up. We drive somewhat south of town. Our guide becomes confused and we walk about $1\frac{1}{2}$ miles over gently rolling grazing land. The soil is Reddish-Chestnut. Formerly it was cultivated. It has suffered some erosion and now has a fairly well developed desert pavement with a thin cover of grass and weeds.

An excavation has been made for us on the edge of a cuesta into the old geological material. On this slope the soil had been thin to begin with and most of it had eroded away down to the *croûte calcaire*. Here the *croûte calcaire* is completely equivalent, so far as I can see, to the hard caliche of our southern plains. The profile we are shown is one beneath the *croûte calcaire*! This is a yellowish-brown calcareous clay (with a tinge of red) having a coarse blocky structure.

Aubert says that this is like the American caliche probably. The soil is developed from calcareous sandstone. The rainfall is now 330 millimeters annually, and Aubert thinks this soil is a fossil of Quaternary age. (I don't see why we are always being shown soils in the mountains or fossil soils



K-1312 May 15, 1947
Algeria. Near St. Aime. Young irrigated olives with
cereal underneath.



K-1313 May 15, 1947 Algeria.
A little way south of Relizane on Reddish-Chestnut
soil with *croûte calcaire* (hard caliche). General
view. Mosque in far left center. (Near site of sample
No. 18.)

in strange places!)

Although time is short I hurry over to a more nearly representative spot to get at least the surface soil that represents the actual soil here now, in which I am much more interested. This is a thin Reddish-Chestnut.

Soil sample No. 18

- | | | |
|--------------------|--------|---|
| A ₁ (p) | 0-12" | Brown, somewhat gravelly heavy loam.
(Reddish-brown when dry.) |
| A ₃ | 12-15" | Similar to above but somewhat lighter in color. (Light reddish-brown heavy loam, when dry.) |

The sample is taken on a 6 percent slope where there is a fairly well developed desert pavement.

Our second stop is on an Alluvial soil in a nearly level plain. The surface is reddish-brown, very fine sandy loam. At a distance, the pit face shows underneath reddish sandy clay, mottled with white at 2 feet or so. The soil has been irrigated since 1942.

The content of organic matter and nitrogen is said to be diminishing in the upper horizons. The soil is said to be rich in phosphorus and potassium, but the chlorides have increased a little under irrigation.

At the third stop near Relizane we see an excellent irrigated Alluvial soil with oranges and other fruits. The surface is a dull brownish-gray silty clay loam, becoming somewhat more silty in depth. The soil has excellent tilth:

Soil sample No. 18

<u>Depth</u>	<u>pH</u>	<u>% Carbon</u>
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Boil sample No. 18

<u>Depth</u>	<u>Sp</u>	<u>% Carbon</u>
A ₁ (p) 0-12"	7.8	1.68
A ₂ 12-15"	8.0	1.13

Flowed clods slake easily and crumble to a granular structure. Generally, the soil in this area is just a trifle salty and possibly not quite so well drained as it should be for oranges, since I notice some dieback.

We miss the fourth stop scheduled and pass through a large area of this soil with some very nice orange trees, protected by tall, narrowly spaced conifers. I see pomegranates, olives, and some other trees. Irrigated olive trees are not pruned so severely as others, but are allowed to grow quite tall. There is also some irrigated barley.

We look at a large salty playa near Clinchant covered with halophytic shrubs and grasses. This is an excellent Solonchak. The soil is grayish-brown silty clay loam, developed from alluvium. Just beneath the surface crust is a thin horizon of fine, highly granular soil. The material beneath is mottled with salt.

We are already late. A good deal of time is wasted here with long recitations of detailed analyses which, of course, vary tremendously from sample to sample within a few feet.

About 5:35 we start for Oran. We first come up on some higher terraces of Reddish-Chestnut soil used mostly for vines and cereals. Some barley here without irrigation may yield 15 bushels to the acre, but most wheat and barley are considerably poorer. (I notice that most of the Arab women



K-1314 May 15, 1947

Algeria. South of Relizane. Irrigation flume on right, drainage ditch on left. Large area of good soil reclaimed here, but just a little too salty and wet for oranges, which show some "dieback," although they look good, on the whole.

here in the country are unveiled.) After leaving the younger valleys we pass through rolling upland with Reddish-Chestnut soil. Outcrops of *croûte calcaire* can be seen in the road cuts. There are some vines, poor pasture, and thin cereals. Barley will likely yield 4 to 10 bushels per acre here.

It is practically impossible to write. We are very late and our driver is going as fast as possible on these rough roads.

The strongly rolling land is used largely for pasturing goats. This has led to erosion with *croûte calcaire* exposed in spots.

We pass Bouguirat around 6 o'clock. Here we are in another broad plain with vines, cereals, olives, and pasture. Patches of onions for seed are seen occasionally. After a few kilometers we pass over a long, small eroded ridge and down into another broad valley. In the sandy part of this plain there has been some soil blowing, with the formation of a few low dunes. Windbreaks are badly needed. The soil is largely devoted to vines through which there is some soil blowing that could be stopped easily. North of Aboukir we pass into uplands with *croûte calcaire* to be seen in the road cuts. The strongly rolling slopes show significant erosion, but the undulating uplands do not. The chief crop is wine grapes and there are some olives and cereals. Here it is a common practice in many vineyards to plant one row of barley, oats,

or rye between the rows of vines as a local windbreak on these sandy soils. Sometimes there are 2, 3, or 4 rows of grapes between each row of cereals. Parts of this upland are quite sandy and subject to blowing.

About 6:30 we pass Mostaganem and drive onto a sandy coastal plain. The vines here are rather poor. About one-quarter mile south of the road is a steep escarpment with exposures of *crôte calcaire*. This is penetrated by a few deep arroyos. There are dunes near the sea to the north. Just above Port-Aux-Poules we pass over a broader plain with gentle slopes toward the south. These are sandy Reddish-Chestnut soils, mostly in vines. We turn from the sea toward Renan and Oran on undulating bright Reddish-Chestnut soils, mostly in vines.

We travel for a long ways in the dark. To arrange the trip like this is sheer foolishness. We are all very tired and can see nothing. We reach the Grand Hotel in Oran about 8:30, and have a very late dinner. My back is very tired tonight so I load up with aspirin and go to bed.

May 16: Oran to Tlemcen

We are wakened at 5 o'clock. I leave part of my baggage in the hotel. With a few unnecessary delays we are again in the busses at 6:40 a.m. for what promises to be a hard day.

A little ways out of Oran the fields are a mixture of cereals, fallow, and pasture on Reddish-Chestnut soils. Beyond Arbel we drive over a well drained plain with Reddish-Chestnut soil. There are some irrigated orchards and gardens near the edge of scattered farms and villages. Beyond Ste. Barbe-du Tlélat we pass over a strongly undulating plain, mainly cereals but with hay, olives, and vines. On slopes over 3 percent the presence of desert pavement indicates quite a bit of erosion. Here and there a few pigs are herded on the cereal stubble, as well as small flocks of goats and cattle. But the animal population is not very great. Here and there a few chick peas (Cicer) are grown. In this plain are some gently rolling areas.

Just above St. Denis^{du Sig} I see a large gently undulating plain to the north and rolling country to the south. Although the agriculture is mixed, barley and other cereals are the principal crops. Most of this barley is too short to cut even the way they do it here by hand with sickles. I wonder why they don't use more grain sorghums. In places the irrigated barley looks fair. Near St. Denis there are now olive groves and gardens, with prunes, figs, and other fruits. To the

south are nearly barren severely grazed hills. On the plain to Perregaux I see poor barley and pasture, with a few fair fields of cereal where irrigated.

At Bou Henna we see some rather poorly irrigated soil. I suspect that too little water is available for the land under irrigation, and not enough attention is given to drainage, which is left primarily to the natural drainageways supplemented with only very few ditches. Along here one sees little machinery, except for a tractor, mower, or binder once in a great while. Here tomatoes, some sort of cucumber or melon, oranges, beans, and artichokes are grown.

We stop about 2 kilometers east of Perregaux in a salty area that is very difficult to drain. The salt is carried in the flood water from the hills. The chief plants are: Suaeda ^{maritima} (sp.) in the driest places, Salicornia ^{herbacea} (sp.) in the wettest spots, and Atriplex halimus in the intermediate places. (See page 48 of guide book.)

Beyond, we pass over somewhat higher terraces, partly eroded, with poor pasture and cereals. At Oued we turn north. I see more fallow and some vines along with cereals. To the east are nearly barren hills with slightly higher terraces with desert pavement and exposed croute calcaire in places. Near Nouvion the land is nearly one-half vines, with irrigated olives and gardens in the village. The soil beyond is not quite so reddish. The slopes over 7 percent are often



K-1315 May 16, 1947 du Sig.
Algeria. 6 kilometers west of St. Denis, Looking east
to lower plain of irrigated olives.



K-1316 May 16, 1947
Algeria. Near Nouvion. Gullying on hilly land of
10-14% slope in poor barley.

badly gullied. The barley is poor. With controlled grazing a great deal more production could be had here.

Northwest of Nouvion we see some more Solonchak in the old playas.

I notice here that the cereal straw is carefully stored in rectangular stacks and covered with mud. Just north of Nouvion I look at a Reddish-Chestnut soil on an old terrace. There is a crop of thin barley. The slope is about $1\frac{1}{2}$ percent. The sample has to be taken in a great hurry. This is a pity because I believe this represents the normal soil.

Soil profile sample No. 19

A _p	0-17"	Dark reddish-brown, heavy loam. (The surface may have had a very slight silting from above.) (Reddish-brown when dry.)
A ₃	17-20"	Transitional. (Not sampled.)
B	20-24" +	Reddish and Yellowish-brown, heavy loam, with some lime concretions. (Light reddish-brown mottled with pinkish white, when dry.)

This stop was really made to look at a wet silted salty drainageway. Thus only by accident am I able to look at the normal soil!

On these loping Reddish-Chestnut soils some of the farmers make very small stone terraces. The small stones are fragments of the *croûte calcaire*.

SAMPLE No.	HORIZON	DEPTH <i>Inches</i>	pH	ORGANIC MATTER by H_2O_2	SIZE CLASS AND DIAMETER OF PARTICLES (in mm.)							OTHER CLASSES (in mm.)		
					Fine gravel, 2-1	Coarse sand, 1-0.5	Medium sand, 0.5-0.25	Fine sand, 0.25-0.1	Very fine sand, 0.1-0.05	Silt, 0.05-0.002	Clay, <0.002	0.02-0.002	<0.005	>2
No. 19 447 Algeria-8-1	A _p	0-17	7.6	0.3	0.0	0.2	2.0	12.0	9.0	27.1	49.7	16.2	58.4	0
	B	20-24+	7.7	0.1	0.7	0.7	1.5	8.0	6.2	53.1	49.8	23.8	61.9	7
8-1	A _p	0-17												
8-2	B	20-24 +												
				% Carbon										
				1.68										
				1.12										
					Reddish Chestnut - North of Nouvion, Algeria.									



K-1317 May 16, 1947

Algeria. Near Nouvion. Stone terraces on eroded
Reddish-Chestnut soil of 4 percent slope. Most of
the stones are fragments of croute calcaire
(hardened caliche). (Pendleton in photo.)

P-XL A



Algeria. Near St. Denis du Sig.
Kellogg in foreground. (Photo by Pendleton.)



K-1318 May 16, 1947 du Sig.
 Algeria. North of St. Denis, Native Arab village on
 eroded Reddish-Chestnut soil. Walls and houses made of
 crôte calcaire.



K-1319 May 16, 1947 du Sig.
 Algeria. North of St. Denis, Eroded Reddish-Chestnut
 soil with erosion pavement of fragments of crôte
 calcaire.

Apparently the soils of the low alluvial plains are much influenced by the origin of the water coming from the hills. Some springs are relatively fresh while others are salty. Irrigation here is very difficult because of the lack of water, poor drainage, salty water, and seepage from the hill torrents. Part of the farmers here live in villages and part in individual scattered farms.

We drive off the road on undulating Reddish-Chestnut soil to a low area of Solonchak. They are just starting to harvest wheat on the Reddish-Chestnut soil with a binder. This will likely yield from 6 to 8 bushels per acre.

There are many Solonchak in these old salty playas. I notice an interesting little plant that is common here on the land that is not very salty. It is bushy and about 1 to 2 feet high. It is strikingly bright blue in color. (Eryngium triquetrum (?)).

We drive west over a broad area of Solonchak-Reddish-Chestnut complex nearly to Fornaka. (Along here we see a nice mirage.) Just before this village and after we are on an undulating to gently sloping Reddish-Chestnut soil with *croûte calcaire* exposed in places. It is used mainly for vines with some cereals. Southwest of us I see an enormous salt marsh.

We go to la Macta, where there are high dunes, and then turn south on the west side of the salt marsh, toward St. Denis again. The soil is mostly Reddish-Chestnut with places

badly eroded. The walls and houses are made largely of fragments of *croute calcaire*..

Near the village I look at the soil in a road cut where it has about 8 to 10 inches of dark brown cobbly loam. Underneath is a layer of dark gray material containing shells and stones - an old kitchen midden. We continue south on a well drained, low, gently undulating sandy plain. Occasionally, we pass over some higher benches of eroded stony Reddish-Chestnut soil with *croute calcaire*. The cover is vines, poor cereals, pasture, and some fallow, depending upon the local soil type. A little way above St. Denis, we pass irregular patches of Solonchak. Near the town the olives, vegetables, citrus, and other fruits look good on the whole.

We have lunch in the local dance hall in St. Denis. On the walls are highly colored photographs of American movie stars and other attempts at gay decorations. The waiters are dirty little Arab boys, very slightly cleaned for the occasion. Again we have many pretty speeches in French. It is made quite plain that the visitors are expected to speak well of the French efforts in agriculture and colonization or else to make constructive suggestions now!

We rise from lunch at 2:50 p.m. and go east over the same road that we travelled this morning to Bou Henni. The site of the old town is a little north of the present one in a formerly fertile plain. The old town was completely

destroyed by a flood. Following this many areas of Solonchak appeared in the plain. Both drainage and irrigation are now being planned. There is much trouble to stop the water at the foot hills early enough to prevent it coming onto the plain and causing swamping and other damage. Much of the water from the hills is salty.

Many of the soils in this region, near Habra, are now just on the margin of salt content. Orange trees show some effects. I see some nice lemons on relatively recent alluvium. But these show some Chlorosis indicating deficiencies of iron, manganese, and zinc, according to Wallace. These are growing on soil that consists of a nearly uniform gray very fine sandy loam about 4 or 5 feet over old alluvium.

We drive into Perregaux again and the party stops for refreshments. Only alcoholic drinks are available! Although I regard this as a warm day, most Arabs are wearing 1 or 2 jackets and an overcoat.

Again we go west toward St. Denis. This is another badly planned day. Already it is 5:10 and we have hardly started on our trip.

We turn south at St. Lucien on a gently rolling plain with Reddish-Chestnut soil. The crops are vines, cereals, and chick peas. Here much of the soil is quite deep Reddish-Chestnut but even so, unirrigated cereals are poor. Two or three kilometers below St. Lucien the soil is again rolling



K-1320 May 16, 1947

Algeria. South of St. Lucien. Landscape, with
small irrigation dam in center background.

and there is some erosion. We pass a dam impounding water for irrigation.

Beyond Lauriers-roses there is a mixed culture. The crôte calcaire is well developed. Some very steep slopes that should not be cultivated are in poor cereals. I see more chick peas. Olives are grown on very steep slopes with side hill ditches about 2 feet wide and 2 feet deep. Then we pass onto a broad alluvial plain with some vines. All along here some of the vines are very poor from the effects of the late frost. In the hilly areas we see the black tents of Arab nomads. In places the valley is narrow and in other places quite wide. There is irrigation in spots.

Beyond Les Trembles we pass onto a large gently rolling plain with good Reddish-Chestnut soil. There is a mixed culture of vines, cereals, olives, and pasture. I see a few sheep.

We pass Proudon. This is certainly beautiful country in the late afternoon sunset.

We pass Sidi-Bel-Abbes, the headquarters of the famous Foreign Legion. We pass over a broad, nearly level plain with mixed culture. Near the cities and villages the land is mostly in olives, fruits, and vegetables. This whole region has recently had a very severe rain storm.

Beyond Detrie there is a good deal of fallow and cereal. About 10 kilometers further there are more gently undulating soils which are a bit darker in color. The vines are poor because of the late frost but the cereals are a little better. Beyond Tassin the soil is again somewhat more rolling. The vines are better because of better air drainage.

Much to my amazement and disgust the party stops again for refreshments at Descartes. It is now 7:30 and most of us are awfully tired. It is too dark to write any more.

We arrive at the Hotel Atlantic in Tlemcen just before 9 o'clock. I have my dinner at 10 o'clock and then to bed.

May 17: Tlemcen, Beni Badel, and El Aricha and return

I am up at 1:20 a.m. because of bedbugs! Some sort of night clerk is sleeping by the desk and I finally make him understand what the trouble is. Every other room in the hotel is occupied. He comes in and remakes my bed with a different mattress and bedding, and everything is all right.

I am up again at 6 o'clock considerably short of sleep. This is a gorgeous morning. Breakfast is very slow and inefficiently served. A few of us leave in special cars to visit Beni Badel dam at 7:20. Tlemcen is a beautiful city. We go out southwest of town where we see the remnants of a series of big forts built in the 10th century.

Originally this hilly land above about 3000 feet was forested. The soil is a dark reddish-yellow, developed from rocks of the Jurassic period. From the hilly road one looks over a beautiful plain, with olives, vines, and some cereals.

The soil here seems to be transitional between Brown Forest and Reddish-Chestnut. Most of it is non-calcareous. We soon come into a region of cork oak forest. Some views here make me think of Greece. The upper plateaus are stony in places, and probably eroded. We come up on the hills to over 4000 feet. The soil is hilly, rocky, and reddish and yellowish-brown in color. In places there is a good stand of cork oak and live oak. The soil under the forest is a slightly degraded Brown Forest.

We arrive at Beni Badel dam. The high inland valley northeast of the dam has a "well scrubbed" appearance. There is some mixed farming and a good deal of wild land pasture. The soil has had quite a bit of erosion. One sees only a few feeble attempts at proper terracing and contouring. A few patches of olives and some cereals are irrigated. On the slopes especially, there is a good deal of overgrazing with goats.

The dam sets in a shrubby landscape between high rocky cliffs. The lower formations are limestone. Part of it is dolomite of the Jurassic period. To the southwest are high cliffs of primary rocks extending from Morocco and sloping

eastward. Because of the highly faulted and unstable limestone it was very difficult to build a dam in this valley.

The outlets for the dam are quite interesting. Because of the sudden showers it is necessary that provision be made for a lot of water to pass through the dam quickly. So instead of running directly over the edge it pours over the sides of many long rectangular galleries that extend back into the pool from the face of the dam. (Only recently this area had 300 millimeters of rain in $2\frac{1}{2}$ days -- a rainfall equivalent to one-third of the average annual.) The whole dam was designed for strength with as little weight as possible. The dam is built in two parts, and on one side equipment is being installed for the generation of some electric power. One purpose of the dam is to supply drinking water to Oran -- 165 kilometers away. The city requires about 100,000 cubic meters per day from this source. The greater part of the remaining water will be used for irrigation.

The dam was built in 1934 at a construction cost of three hundred million francs. They now estimate a total cost of two billion francs for conduits, filtration plants, tanks, and all the other installations.



K-1321 May 17, 1947
Algeria. Beni-Badel dam spillway.



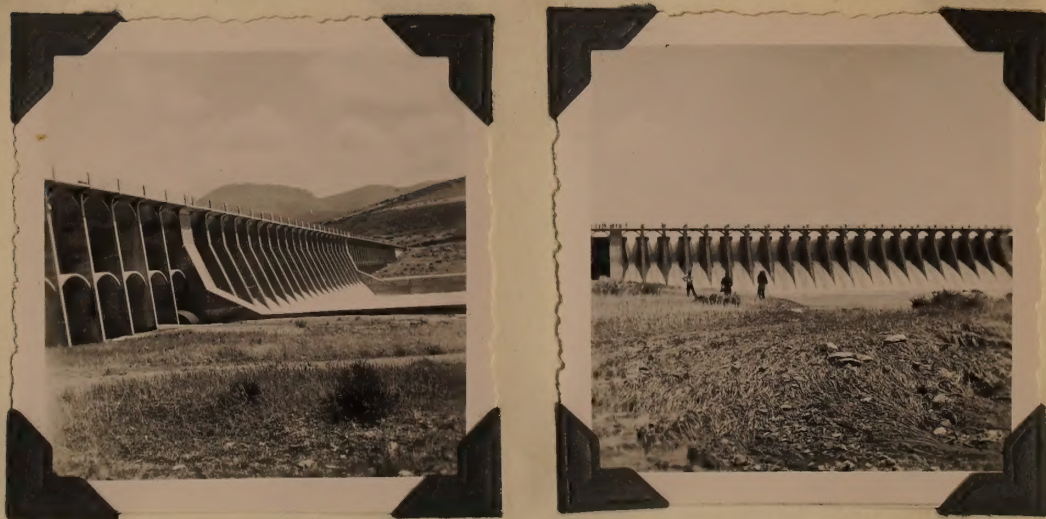
K-1322 May 17, 1947
Algeria. Beni-Badel dam.



K-1323 May 17, 1947
Algeria. Side of valley below Beni-Badel dam.



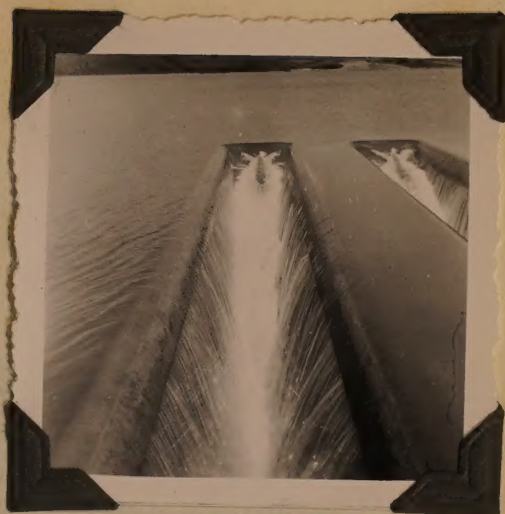
K-1324 May 17, 1947
Algeria. Part of Beni-Badel dam.



Views of Beni-Badel dam given me by M. Puydebat.



Views of Beni-Badel dam given me by M. Puydebat.



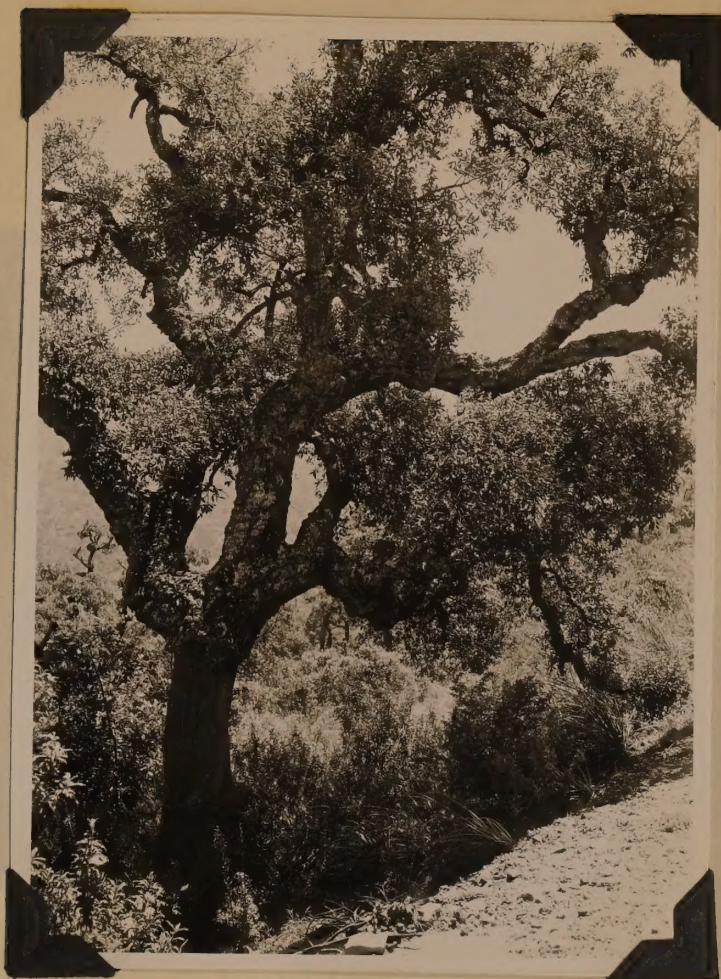
Views of Beni-Badel dam given me by M. Puydebat.



K-1325 May 17, 1947
Algeria. Below spillway of Beni-Badel dam.



K-1326 May 17, 1947
Along road from Tlemcen to Beni-Badel dam.
Olive trees 300 to 400 years old. (Aubert)



K-1327 May 17, 1947
Algeria. In mountains near Tlemcen. Cork
oak on degraded Brown Forest soil.



K-1328 May 17, 1947

Algeria. In mountains near Tlemcen. General view
of cork oak on degraded Brown Forest soil.

We return over the same road and stop to look at some olive trees of great age, and for a quick examination of the soil under the cork oak. Everybody seems to be in a great rush for some reason unknown to me. At 11:30 we are back at Tlemcen for a reception by the municipal officials. Of course, more drinks. I stop in a few shops on the way back to the hotel, then lunch, and in the busses at 1:45 p.m.

On this trip we go east of Tlemcen past one of the most beautiful series of cascades I have ever seen. For a way the road goes over badly eroded soil developed from limestone. It is hilly, rocky, overgrazed, and covered with thin shrubs. The soil is reddish-brown and appears to be transitional between Brown Forest and Reddish-Chestnut. As we pass on, I see some smooth areas of Reddish-Chestnut with vines, olives, and cereals. Some of the land is fallow. There are a few patches of poor cereals on the shrubby, overgrazed slopes. We pass a few high terraces with heavy gray soil, which is probably a partially truncated Rendzina.

From Lamoricière we turn southwest toward Sebden. A recent rain had washed out bridges on the direct route from Tlemcen to Sebden. Just after leaving Lamoricière we enter a rather narrow valley with mixed farming on sandy Reddish-Chestnut soil.



K-1329 May 17, 1947
Algeria. Near Tlemcen. Cascades.

At 3 kilometers we see the first group of black tents of the nomads. In places the plain of the valley is broad, nearly level, and well tilled. Some of the Arab farmsteads are good; others are very crude, grading down to shabby tents protected by a little brush. On the better land the cereals are fair, with barley running about 8 to 17 bushels to the acre, I estimate.

After some 18 kilometers along this road the valley is narrow and stony. There are more nomads, and cereals, although poor, are the only important crop. Then we come into a rather broad undulating plain that is poorly tilled, and terribly overgrazed by sheep and goats. Most of the people are dwelling in very crude houses or tents. The cereals are very poor indeed. There are many small shrubs even in the fields. The agriculture gets just a bit better as we come close to Sebdom. Near the city there are some vines. The soil is getting close to Reddish-Brown. At 3 kilometers south of Sebdom, the soil is rolling and hilly, shrub-covered Reddish-Brown. There are some fields of essentially worthless cereals. The soil is much less red here than further north.

The party makes a stop 14 kilometers south of Sebdom, or 35 kilometers north of El Aricha. There is considerable confusion, and I need to look at the soil and get my pictures

in great haste. This is a Reddish-Brown soil on $1\frac{1}{2}$ percent slope. The area was once cultivated but long ago was abandoned to grass. Near the profile pit are two trees — the last two north of the Sahara on the way south.

Soil profile sample No. 20

- | | | |
|----------------|----------|--|
| A _p | 0-8" | Light reddish-brown to reddish-brown friable loam; firmly held by grass roots. ^{1/} |
| A ₃ | 8-11" | Pinkish-brown, heavy loam, with only the faintest prismatic structure. (Light reddish-brown when dry.) |
| C _c | 11-18" | Yellowish and pinkish-gray, calcareous silty loam, mottled with white. (Pink when dry.) |
| C ₁ | 18-31" | Mottled gray, yellowish-gray and pinkish-gray, compact silty loam. (Pink and pinkish-white when dry.) |
| C ₂ | 31-60" + | Similar to above, but slightly darker in color and heavier in texture. (Dark pink and pinkish-white when dry.) |

I suspect this soil is developed from very old alluvium. There are some fragments of the hardened *croûte calcaire* on the surface.

As we go along south I see some areas of Solonchak. The landscape looks very much like that of the Reddish-Brown soil in the United States, except for the black tents of the nomad Arabs and their camels. These tents are roughly symmetrical,

^{1/} This sample collected 20 feet away because surface near pit contaminated by excavation.



K-1504 May 17, 1947
Algeria. Near Tlemcen. Strip cropping near the city on transition Brown Forest and Reddish-Chestnut.



K-1332 May 17, 1947
Algeria. Part of crowd at reception in El Aricha.

SAMPLE No.	HORIZON	DEPTH	pH	ORGANIC MATTER by H ₂ O ₂	SIZE CLASS AND DIAMETER OF PARTICLES (in mm.)							OTHER CLASSES (in mm.)		
					Fine gravel, 2-1	Coarse sand, 1-0.5	Medium sand, 0.5-0.25	Fine sand, 0.25-0.1	Very fine sand, 0.1-0.05	Silt, 0.05-0.002	Clay, <0.002	0.02-0.002	<0.005	>2
S47Algeria-9-1	No. 20	Inches	8.0	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.
					1.7	2.4	2.6	16.6	14.3	33.7	28.7	25.0	40.0	8
					1.0	1.9	1.5	9.0	11.1	41.0	34.5	33.5	52.1	<0.5
					2.5	3.8	1.9	5.9	7.9	51.0	27.0	44.2	46.8	<0.5
					Reddish Brown - 35 kilometers north of El Aricha,									
9-1	A _p	0-8		<u>% Carbon</u>	Algeria.									
9-2	A ₃	8-11		1.47										
9-3	C _c	11-18		0.29										
				0.40										

many-sided rounded polygons, about 7 feet high. They have a central pole, or perhaps more, and then somewhat shorter poles near the edges. For a long distance we pass over a great plain. I see almost no shrubs or cacti. The principal grass here is called "alfa" (= Stipa tenacissima). There is also some Artemisia (sp.).

We stop 36 kilometers south of Sebdom, or 14 kilometers north of El Aricha. The party is extremely late and there is not time for any detailed description or examination.

Soil profile sample No. 21

A ₁	0-6"	Reddish-brown loam.
A ₃	6-15"	Somewhat lighter reddish-brown loam, with very little evidence of prismatic structure.
C _c	15-160"+	Soft light gray, with tinge of pink limestone, or crouê calcaire. (One sample taken at 2 feet and one at 10 feet.)

I take another sample of the A₁ horizon just 25 feet west of the prepared profile, partly because the surface around the profile seemed to be somewhat contaminated with material from beneath.

The land here is nearly level. The "alfa" grass occurs in tufts that set up about 3 inches from the general soil level. Between these tufts the soil is bare. There are many snails on the surface. There is some blowing of the soil and perhaps a little local wash. One wonders about the deep

SAMPLE No.	HORIZON	DEPTH	pH	ORGANIC MATTER by H ₂ O ₂	SIZE CLASS AND DIAMETER OF PARTICLES (in mm.)							OTHER CLASSES (in mm.)		
					Fine gravel, 2-1	Coarse sand, 1-0.5	Medium sand, 0.5-0.25	Fine sand, 0.25-0.1	Very fine sand, 0.1-0.05	Silt, 0.05-0.002	Clay, 0.002	0.02-0.002	<0.005	>2
<u>No. 21</u> S47Algeria-10-1 A ₁ 10-2 A ₃		Inches		Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.
		0-6	8.0	1.5	0.3	1.6	7.0	33.0	13.7	18.6	25.8	13.7	34.0	11
		6-15	8.1	2.3	2.5	3.5	5.7	20.7	12.4	19.4	35.8	14.2	42.8	27
10-1 A ₁		0-6		<u>% Carbon</u>	Reddish Brown - 14 kilometers north of El Aricha									
10-2 A ₃		6-15		1.67	Algeria.									
10-3 C _c		2 feet		0.65										
				0.58										

croûte calcaire, how it may have formed and whether this is not a fossil of an earlier more moist period.

Even along here and south are little patches of worthless barley. There are no houses, only nomad tents. One sees sheep, goats, and a few camels and horses.

We pass through El Aricha but cannot go on south (fortunately since it is already 6 o'clock) on account of a wash caused by the recent cloud burst. All around this town the land is terribly overgrazed; I think the worst I have ever seen, even worse than in Iran.

Our party stops in El Aricha for entertainment by the local Sheik. We squat before low wooden tables about 8 inches high on beautiful heavy rugs within a low black tent. We are served mint-flavored, very sweet hot tea, brought on large trays and poured from silver pots. With the tea little sweet cakes are served.

We do not leave until 6:55 and now have all this distance to go back to Tlemcen tonight. Thus we drive over 70 kilometers in utter darkness. Some more poor planning! It is such a waste of energy to spend time traveling in complete darkness. I return to the hotel at 9:30 and spend as little time at dinner as possible. I hope the bedbugs will leave me alone tonight.



Algeria. The Arab gentry serve us tea.
(Photo by Pendleton.)



Algeria. Arab boys at El Aricha dressed for a warm day. (Photo by Pendleton.)

May 18: Tlemcen to Oran

I am up at 6 o'clock. This is a bright sunny morning already well advanced because of the very slow time here. We leave Tlemcen going west at 8:15. Near the city is a nice valley with olives, vines, and cereals. But this soon plays out, and we find ourselves in strongly rolling to hilly land, with some cereals and much overgrazed pasture. This appears to me to be thin, stony Reddish-Chestnut soil over Jurassic calcareous sandstone, limestone, and dolomitic limestone. On some of this thin land I notice a little palm (Chamaerops humilis) or Mediterranean palm, which reminds me of the sawpalmetto of the South, although this is smaller. Also I see tufts of an unpalatable grass. Originally, this area was said to have a cover of thin forest, but for many centuries it has been without forest. The hills are quite generally eroded, and on the highest hills there are somewhat podzolized soils like those seen yesterday in the cork forest, especially on the sandstone. Bramao says that in Portugal the cork oak always grows on somewhat podzolized soils -- even on many with well developed ortstein. He says that cork grows on soils usually of about pH 6.0 but, of course, not all podzolized soils in Portugal have cork.

At somewhat lower elevations there are Brown Forest and Rendzina soils. Still lower down are Terra Rossa and Rendzina.

at the lowest level there are Reddish-Chestnut, Alluvial, and Solonchak, with perhaps a few spots of Chernozem. The Alluvials from these soils are very fertile and reddish-brown in color.

We pass Turenne. Here is a broad undulating plain bordered by rolling thin soil. The agriculture is mixed with considerable olives and wine grapes. Most of the olives are irrigated. The cereals are poor, probably about 3 to 5 bushels per acre. The soils are generally Reddish-Chestnut with some spots of Rendzina. The cereals are so short this year that some fields are simply grazed. Most of the hilly areas have erosion pavement, even down to 3 percent slope, or perhaps less where much water comes from above. The erosion depends enormously upon the shape of the slope.

Some distance west of Turenne near the Tafna valley there is thin hilly eroded soil on limestone, covered with small shrubs and trees. Among these is the conifer (Tetraclinis articulata)-- used for fancy veneers. As we go on further, we traverse a very severely eroded nearly barren hilly area, partly of gray clays of Miocene times. This landscape resembles the badlands, but with somewhat softer curves. The fertile alluvial soils of the Tafna valley originated in part through the erosion of these marly clays. Most of these clays contain too few stones for a pavement to form.

For a considerable distance east of Marnia there is eroded Reddish-Chestnut soil on gently rolling and undulating terrain. It looks very bad now because of the drought. The surface is nearly barren and has a light pinkish-brown color. A part of the soils here are now being prepared for future irrigation. Near the city of Marnia we see irrigated olives, vegetables, and alfalfa, and also some vineyards. In Marnia the rainfall is about 400 millimeters annually, but it is unevenly distributed. As usual, the town has many nice little irrigated gardens. Beyond Marnia the soil is pinkish and undulating Reddish-Chestnut soil on the well drained terraces. The valley is quite wide, and the agriculture is mixed. The lower places are farmed quite intensively under irrigation. Without irrigation the land now is essentially barren, although nearly all of it had been seeded to cereals. These unirrigated crops are a complete failure. The land has had essentially no rain since January, except for the cloud burst last week.

To the left we are able to glimpse Oudjda in Morocco.

On the north margin of this plain -- Plaine de Marnia -- are some areas of rather bright red Reddish-Chestnut with vines. But then we are soon back into nearly barren cultivated hills and small alluvial valleys. As we go north into higher land some of the barley is being harvested. It may yield 1 to 3 bushels per acre.

We pass St. Boy Djenane. Here the land is rolling. The steep upper slopes are stony. On some Alluvial soils cereals may run 1 to 3 bushels per acre. Above the village we come onto a rolling Rendzina now used for cereals that may run 2 to 4 bushels per acre. There is a dark gray surface 6 to 24 inches deep over light colored soft material. We stop to look at the soil in a road cut. Here there may have been some slight accumulation. The slope is about 5 to 30 percent in the field. I should regard this soil as an excellent Rendzina.

Soil profile sample No. 22

A _p	0-20"	Very dark gray to black granular clay loam.
A ₁₂	20-35"	Very dark gray to black granular clay loam.
A ₃₁	35-42"	Slightly grayer, granular clay loam. (Not sampled.)
A ₃₂	42-47"	Transitional. Gray, finely mottled with white, clay loam.
C	47-100"+	Light gray soft material (white when dry) containing a few lumps that resemble a highly weathered granite or andesite.

There are several profiles made here in the bank; some have a rather heavy crust below the A₃, and I take a special sample of this hardened material, which is light gray specked with black. In some places the soil has been eroded a bit, and in other places, as here, there have been some accumulations through creep. Where I take sample No. 22 there are

Northwest of St. Boy Djenane, Algeria

Rendzina

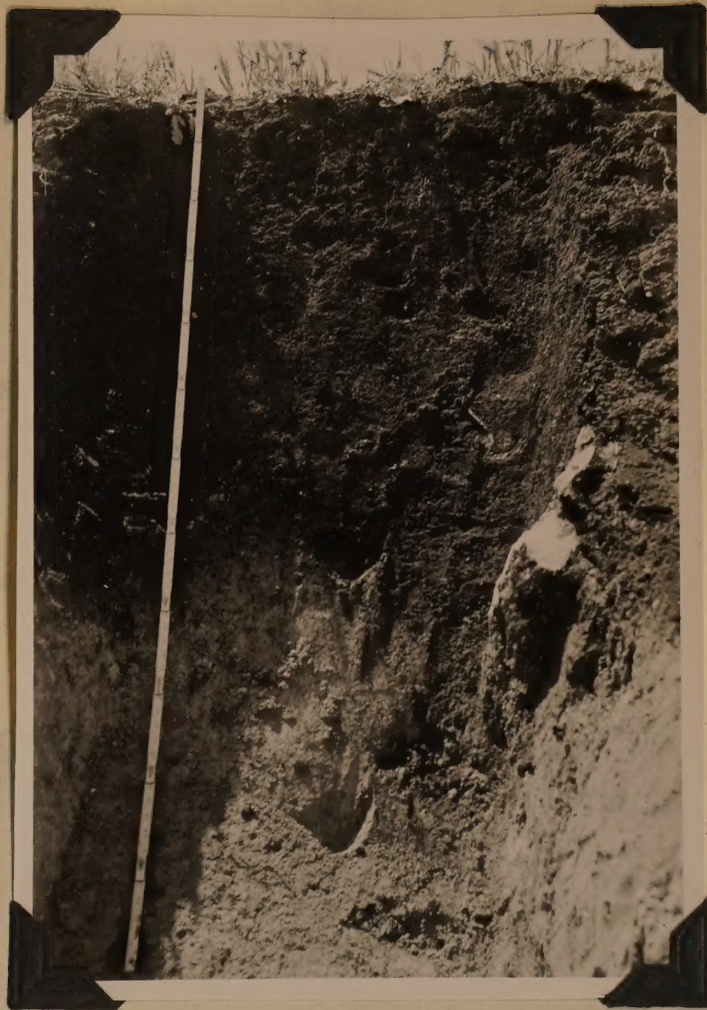
SAMPLE No.	HORIZON	DEPTH	pH	ORGANIC MATTER by H ₂ O ₂	SIZE CLASS AND DIAMETER OF PARTICLES (in mm.)							OTHER CLASSES (in mm.)		
					Fine gravel, 2-1	Coarse sand, 1-0.5	Medium sand, 0.5-0.25	Fine sand, 0.25-0.1	Very fine sand, 0.1-0.05	Silt, 0.05-0.002	Clay, <0.002	0.02-0.002	<0.005	>2
<u>No. 22</u> S47Algeria-11-1	A _p	0-20	7.8	4.8	1.3	2.1	2.3	6.3	6.2	28.4	53.4	19.6	60.5	<0.5
	11-2 A ₁₂	20-35	7.8	2.9	2.4	2.6	2.0	6.0	7.4	26.5	53.1	17.7	59.2	8
	11-3 A ₃₂	42-47	7.9	2.2	1.9	2.2	1.6	5.1	12.7	26.6	49.9	18.4	57.8	<0.5
	11-4 C	47-100	8.3	0.8	4.7	7.8	4.6	9.7	11.8	32.6	28.8	23.0	39.2	<0.5
				<u>% Carbon</u>	Rendzina - Northwest of St. Boy Djenane, Algeria.									
11-1 A _p				3.24										
11-2 A ₁₂				3.37										
11-3 A ₃₂				1.74										
11-4 C				0.01										
11-5 C (special)				pH 8.6										

soft boulders of this hardened material; in other places it looks like a hardened layer. Not too far distant are some volcanic craters, and the parent material of this soil may be partly marl and partly volcanic ash. These boulders resemble soft weathered rock; they are light gray and contain fairly large crystals of biotite. Thus, although this looks like marl, it may be weathered volcanics. Aubert says that nearly all these black soils occur near the volcanic ridges. Some of the French suggest that this soil may be a kind of Chernozem. I shouldn't agree with that. I am convinced that the normal soil is a Reddish-Chestnut. Muir would not call it a Rendzina, but has no alternative. He regards the Rendzina as a thin, stony, dark gray soil, developed in a forested region. Certainly there could not have been more than a very thin forest here.

We turn back toward Si. Tahar near the site of the famous (Sidi Brahim) Arab-French battles about 1890. Here is hilly land. The soil is a light brown, and is developed mostly from rather soft clays. The gently sloping uneroded areas have reddish-brown soil. The cereals here are practically worthless because of the drought.

(near Sidi Bou Djenen or Coloune Montaguac)

About 2 kilometers south of Si. Tahar, we stop to look at some work with terraces and reforestation for erosion control. The terraces are made for the planting of fruit trees on dark brown soil. Certainly there were some volcanics in the parent material here. The terraces are about 4 meters apart



K-1333 May 18, 1947 (near Sidi Bou Djenan)
Algeria. Southwest of Si. Tahar. Profile of
Rendzina. (Site of sample No. 22.)



K-1334 May 18, 1947
 Algeria. Southwest of St. Tahar. General view of
 profile of Rendzina. (Site of sample No. 22.)

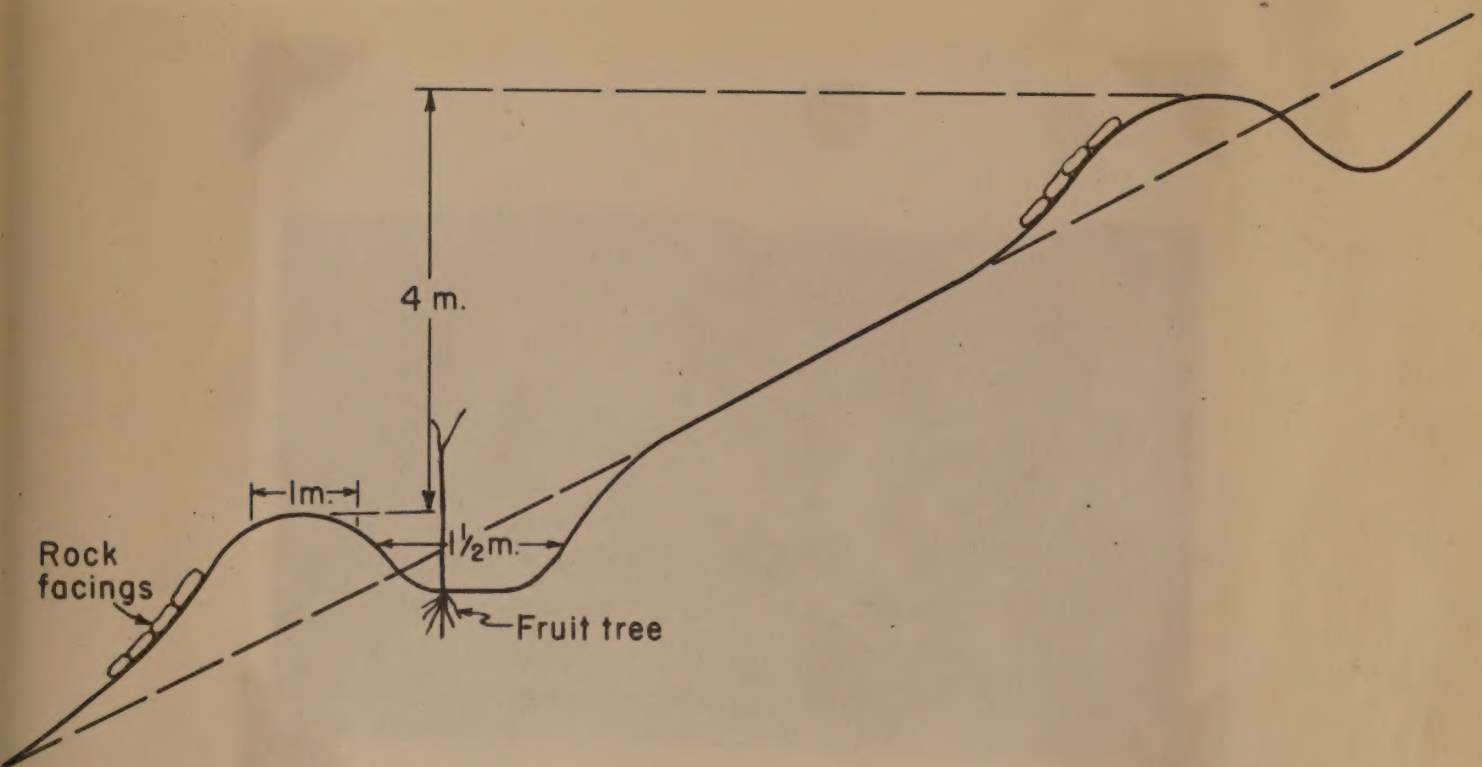


K-1335 May 18, 1947
 Algeria. Near St. Tahar. Site of Arab-French battles
 about 1890. (Sidi Brahimi)

vertically. Each channel is about $1\frac{1}{2}$ meters wide and the ridge is about a meter high. The lower down-slope face of the ridge is paved with stone. Of course, horizontal distance between terraces depends on the slope. The terraces are laid out at a slight angle to the contour. Here terraces have to be made especially strong because of the hazard of enormous downpours. The trees are figs, olives, almonds, and carob. This looks like good work to me. The work is being done in part to protect the nearby harbor of Nemours. Tractors are used in making some of the terraces. Local Arabs do most of the work. The farmers will cultivate between the rows of trees when the whole thing is stabilized. In addition to the terraces I see some specially prepared and protected drainageways necessary in case of heavy storms. This work is a good deal like that we saw near Blida. The people here are called Chleuh, and perhaps take more kindly to this effort than some of the Arabs.

It was a little difficult to get much on costs. Many of these are built entirely without machinery. With hand labor it requires 200 man-days to treat one hectare, and one man-day costs about 125 francs. (A trifle more than \$1.00 according to the official rate of exchange.)

Where the land is too steep to terrace rock-lined holes about 2 meters across are made. Where possible, trees or cacti are planted for feed on these slopes. I notice a few



Terraces on steeply sloping soil south of St. Tahar
(Sidi)



K-1336 May 18, 1947
 Algeria. Near *St.* Tahar. New terraces for planting fruit trees and for erosion control. Note stone facings to save all water and be prepared for very heavy showers. Vertical distance between terraces, 4 meters; channel $1\frac{1}{2}$ meters wide; and ridge a little over 1 meter wide. Terraces at slight angle to contour.



K-1337 May 18, 1947
 Algeria. Near Si. Tahar. New terraces for planting fruit trees and for erosion control. Note stone facings to save all water and be prepared for very heavy showers. Vertical distance between terraces, 4 meters; channel $1\frac{1}{2}$ meters wide; and ridge a little over 1 meter wide. Terraces at slight angle to contour. In the foreground M. Drouhin, Chief of the Colonization and Irrigation Service, Algeria.

ponds for cattle. Here I see patches of black soil that are again related to the special character of the parent material.

We now continue on our way to Nemours. The soils are very complex. Many of them are developed from marly clays. These are very erosive, in part because there are not enough stones to form a pavement. In the coves there are very dark brown to nearly black soils (like No. 22). Aubert thinks that the black soils are related to the volcanic rocks and the marly clays of the Miocene.

We come onto a smoother area of Reddish-Chestnut soil, although most of the land is quite hilly. Along the valleys I see some native terracing and contouring. As we come close to the sea the land is hilly and nearly barren along the streams.

Nemours is an important harbor. Close to the city the hills are sandy, overlying basalt and other rocks. They are steep and badly eroded. I am told they have several erosion control schemes similar to the one we have just visited. We sit for lunch between 12:40 and 2:30, and then waste a long time for no explained reason except that our drivers have not finished their lunch!

About 3 o'clock we go south through a canyon with nearly vertical walls, and then into rolling country with some old native terraces for trees.

We pass Nedroma in a steep walled canyon with narrow terraces and mixed culture here and there. Just north of the city we pass some rolling land. I see Reddish-Chestnut soil developed from granite as we climb out from the village on the canyon road. We stop for a moment to look at the soil. The A_1 is extremely variable. In places it is 2 feet deep where the soil has slumped down the slope. The land is very hilly. I take a sample, but certainly it can't mean very much.

Soil profile sample No. 23

- | | | |
|-------|--------|---|
| A_1 | 0-12" | Variable brown and reddish-brown loam. |
| C | 12-60" | Weathered granite, mottled brown, reddish-brown and gray. |
| D | 60" + | Gray granite. |

We drive east into strongly rolling soil from sedimentary rocks, and then again into hilly land. Some distance east of the village of Sidi-Ben-Amar we come out to high rolling plains, with cereals that may run 4 to 6 bushels to the acre. Badlands along the streams are deeply trenched.

Just before crossing the Tafna River we come to a large, low alluvial plain with light brown sandy soil, mostly devoted to vines. On the east side there is Reddish-Chestnut soil on high narrow terraces. This is redder than the Reddish-Chestnut soils of the United States.

Soil profile sample No. 23

	<u>Depth</u>	<u>pH</u>	
A ₁	0-12"	7.9	
C	12-60"	7.9	Weathered granite: Feldspar partly gone; partly in kaolinized masses after original crystals, some still fresh. Biotite bleached from black to brown or yellow; this was probably the source of the iron oxide which colors the remaining material.
D	60" +		Biotite granite - quite quartase, low in plagioclase. Contains muscovite, apatite and zircon as accessories. Possibly it has been very slightly metamorphosed.



K-1338 May 18, 1947
Algeria. 3 kilometers south of Nemours. View of canyon with very old terraces on slopes.



K-1339 May 18, 1947
Algeria. Village of Nedroma at left. Terracing on hilly Reddish-Chestnut soil at right.

After passing through a narrow hilly strip, we come again onto Reddish-Chestnut soil of mixed culture where cereals will yield about 3 to 6 bushels per acre. We then come onto a smoother plain that extends all the way south to Tlemcen. Here there are many walls made from fragments of the crôte calcaire. As we approach Eugene Etienne there are more vines and olives. We stop about 3 kilometers south of Eugene Etienne to look at an old quarry of dolomitic limestone, where the soil is either Terra Rossa or a transition between Terra Rossa and Reddish-Chestnut.

The area has a gentle slope of 3 to 7 percent. I suspect that the rainfall here is a bit higher than it is a few kilometers east or west. The original vegetation was undoubtedly live oak. The surface is very rocky with ledges of limestone. At first glance it would be easy to conclude that there had been deep soil eroded away. I have no doubt that there has been some erosion, but certainly not very much for a great many years at least, as disclosed by the appearance of the tops of the rock ledges. I rather suspect that this area never did have a deep solum above the rock. I suspect that many of the ledges have been continuously exposed during the life of the soil. Certainly it would be very important to find out just how much erosion has taken place on these areas of Terra Rossa.



K-1340 May 18, 1947
Algeria. East of Nedroma. Village of Sidi-Ben-Amar
occupied by Kabyle people.



K-1341 May 18, 1947
Algeria. 3 kilometers south of Eugene Etienne. Terra Rossa
(-Reddish-Chestnut transition ?) from hard dolomitic lime-
stone. (Site of sample No. 24.)

of dwarf-palm (Chamaerops humilis) chiefly by effect of the roots

In the lime rock are deep wide cracks filled with the reddish soil. I suspect that a good deal of the weathering products from the ledges have descended vertically and that there has been relatively little normal erosion along the surface of the ground.

Soil profile sample No. 24

A ₁ (p)	0-13"	Dark reddish-brown clay; rounded blocky structure.
B ₂	13-26"(15-50)	Red clay with weak angular blocky structure; now moist and plastic.
B ₃ and C	36-48"	Very irregular transition. Mottled reddish-yellow and red stony clay.
D	48" +	Dolomitic limestone.

The profiles of soils like these are extremely irregular, but the samples would be interesting to compare with the Decatur of the United States, especially the B's.

We go on to Tlemcen, and very foolishly the party is stopping again for refreshments! It is now 6:40 p.m. and 143 kilometers to Oran. The worst management yet! We start north of Tlemcen for Oran just as the sun sinks behind the hills of Morocco. The country is rolling and well tilled with a mixed culture. We then pass over a lower undulating plain of dark reddish-brown soil with mixed culture. This plain is not very wide and we soon go into a dissected rolling plateau of mixed culture, with cereals predominating. I see some bad

Terra Rossa 3 kilometers south of Eugene Etienne, Algeria

SAMPLE No.	HORIZON	DEPTH	pH	ORGANIC MATTER by H ₂ O ₂	SIZE CLASS AND DIAMETER OF PARTICLES (in mm.)							OTHER CLASSES (in mm.)		
					Fine gravel, 2-1	Coarse sand, 1-0.5	Medium sand, 0.5-0.25	Fine sand, 0.25-0.1	Very fine sand, 0.1-0.05	Silt, 0.05-0.002	Clay, <0.002	0.02-0.002	<0.005	>2
		Inches		Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.
No. 24														
SL47 Algeria-13-1 A (1-p)		0-13	7.8	2.4	0.0	0.2	0.2	3.6	13.0	26.6	56.4	12.8	61.2	0
13-2 B ₂		13-36	7.8	0.5	0.0	0.1	0.2	2.3	10.4	21.5	65.5	10.3	69.5	<0.5
13-3 B _{3-C}		36-48	8.3	0.1	7.3	6.0	2.5	4.0	7.1	37.6	35.5	13.8	38.4	47
13-4	Dolomite, somewhat metamorphosed, containing some chert in veins.													
Thermal Analysis														
				Peak temp.	Kaolinite	Clay								
13-1 A (1-p)		0-13		562	25%	56.4%								
13-2 B ₂		13-36		565	30%	65.5%								
13-3 B _{3-C}		36-48		572	30%	35.5%								
				Terra Rossa - 3 kilometers south of Eugene Etienne, Algeria.										



K-1342 May 18, 1947
Algeria. 9 kilometers north of Tlemcen.
Stony Terra Rossa soil.



Reifenberg near site of sample No. 24.
(Photo by Pendleton.)

accelerated and deep natural erosion on the soft, marly clays.

It becomes too dark to see or to write more. For hours we ride in darkness on a rough road to Oran. We reach the hotel about 10:30 p.m. I am so overcome from fatigue that I skip dinner and go to bed.

May 19: In Oran

A final conference has been planned for today in the Maison de Colon -- the headquarters for farm cooperatives, rural credit agencies, etc. The conference begins at 9 o'clock. The conferees, and more especially the foreign guests, are asked to discuss their observations and make suggestions to the French. At the beginning we have some rather short addresses by M. Drouchin, Chief of the Irrigation Service in Algeria, who discusses the plans for cooperation in carrying out programs for reclamation. He emphasizes the scarcity of water and the critical problem of drainage. They now have nine irrigation dams. M. Barbut, Chief of the Agricultural Department in Algeria, speaks on the same point. Director Ogg, of the Rothamsted Experimental Station, makes a few general remarks on the importance of irrigation in India and other parts of the British Empire. He concludes with a naive discussion of the significance of geology and relief as related to soil characteristics.

Professor Reifenberg of Palestine, summarizes the views on the Mediterranean Red soils (Terra Rossa). On the question of whether these soils are fossil or products of this climate, he insists that they could not be fossil otherwise erosion would have removed all of them long ago. At the same time he recognizes that fossil soils exist, including the Terra Rossa as well as others. He points out that we have seen examples of fossil soils on the excursion.

Are these soils regional? He thinks they are, because only in the Mediterranean area are such soils found widely distributed. He insists that they are rare in the desert. As one leaves the Mediterranean for the desert the soils become more yellow. As one goes to the more humid regions, as into northern Italy, he points out that the red soils give way to brown soils. I think he overstates his case, because certainly red soils are not at all confined to the Mediterranean climate. But upon discussion of this point he readily admits that all of the characteristics must be taken into account, and the Terra Rossa is not to be confused with the red lateritic soils.

He again stresses the movement of water upward during the change of seasons from winter to spring — water that might bring up iron, alumina, and silica. Considering the great importance of water movement in their genesis, he

Professor [Name] of [Institution], [Location], [State],
on the [Date] of [Month] [Year] [Time].
[Name] of [Institution] [Location] [State] [City]
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[Name] would have removed all of them long ago. At the
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certainly red soils are not at all confined to the [Location].
[Name]. But upon discussion of [Name] he really insists
that all of the characteristics must be taken into account,
and the [Location] is not to be contrasted with the [Location].

Intermittent soils.
[Name] stresses the movement of water upward during
the change of seasons from winter to spring — [Name] [Name]
[Name] [Name] [Name] [Name] [Name] [Name] [Name] [Name] [Name] [Name]
[Name] [Name] [Name] [Name] [Name] [Name] [Name] [Name] [Name] [Name]

La Conférence internationale de Pédologie méditerranéenne a terminé ses travaux à Oran

« Souhaitons que dans la paix universelle nous fassions prospérer les cultures magnifiques qui rendront à l'humanité le bonheur auquel elle a droit »

...a déclaré le Président Sicard à nos hôtes

Notre cité a été le siège, hier matin, de la séance de clôture de la Conférence internationale de Pédologie méditerranéenne, qui termine par Oran le cycle de ses études et de ses visites à travers l'Algérie.

Par le fait qu'ils sont les derniers d'une longue série, ces travaux ont revêtu une importance particulière, car les éminents savants français et étrangers qui y ont participé d'une manière active se sont appliqués à faire une synthèse des enseignements acquis et des faits constatés. Et comme l'a précisé le distingué président de séance, M. Oudin, de telles confrontations de points de vue permettront, par des études ultérieures d'orienter vers un but efficace une recherche de cette vérité qui, lorsqu'il s'agit d'une science si utile que celle de l'étude des sols, donnera plus de bien-être à nos populations.

LA SEANCE DU CONGRES

La salle des congrès de la Maison du Colon est emplies d'une foule intéressée, lorsque, à 9 h. 30, M. Oudin directeur de l'Ecole Nationale des Eaux et Forêts, déclare la séance ouverte. A ses côtés, l'on note la présence de MM. Sicard, président de la Chambre d'Agriculture d'Oran ; le docteur Ogg, directeur de la station agronomique de Rothamstead, chef de la délégation britannique ; C.H.E. Kellog, directeur du Service des sols des U.S.A., chef de la délégation américaine ; le professeur Bramao, directeur du Bureau des sols du Portugal ; Barbut, inspecteur général de l'Agriculture en Algérie et directeur de l'Ecole Nationale

d'Agriculture d'Alger, et Aubert professeur à la Recherche scientifique coloniale, qui remplira les fonctions délicates d'interprète.

Firmin ELLUL

(Lire la suite en 2^e page)

AMNISTIE EN GRECE

ATHENES. — On apprend que le Gouvernement grec a maintenant arrêté sa décision d'accorder une amnistie sur une « base élargie » et d'inviter une commission internationale à en contrôler l'application.

Des officiers des polices française, tchécoslovaque, suédoise et islandaise, sont arrivés à Londres pour y étudier sur place les méthodes de Scotland-Yard.



Photo « L'Echo d'Oran »

Cliche « La Photogravure »
Un groupe de congressistes sort de la Maison du Colon. A gauche : le Dr OGG, chef de la délégation britannique. A l'extrême droite : M. C.H.E. KELLOG, chef de la délégation américaine

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de voir 47

— Je ne vois pas ce que l'Empereur vient faire da
 lon du Champ d'Asile ?
 — Me donnes-tu ta parole d'honneur que tu garder
 absolu sur ce que je vais te confier ?
 — Je te la donne,
 — Eh bien ! écoute-moi.

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 dévouement au Tondou.

La Conférence internationale de Pédologie

(Suite de la première page)

Aux premiers rangs de l'assistance, on remarque la présence d'éminentes personnalités déléguées par des pays étrangers, ou par les autorités ou organisations locales : MM. Demolon, président du Congrès méditerranéen, inspecteur général honoraire des stations et laboratoires de recherches agronomiques ; Tinthoin, archiviste départemental et géologue en renom, représentant le Préfet d'Oran ; Ganancia, adjoint au maire d'Oran, représentant M. Casimir ; le colonel Jouteau, représentant le général commandant la Division ; Drouhin, directeur de la Colonisation et de l'Hydraulique au Gouvernement général ; Brochet, ingénieur en chef des T.P.E. ; Prudhomme, directeur des services agricoles de l'Oranie ; Raoux, représentant le Conseil général ; Le Du, conservateur des Eaux et Forêts ; Barnet, inspecteur départemental de l'élevage ; le docteur Abadie ; Guntz, professeur à la Faculté des Sciences d'Alger, etc...

Le Président fixe le but essentiel de ces derniers travaux, qui est de faire le point sur un certain nombre de questions principales, puis il donne la parole au premier rapporteur.

On entend alors un rapport de M. Drouhin sur les relations de l'agriculture et de l'hydraulique ; M. Barbut confirme ensuite les conclusions de M. Drouhin et le docteur Ogg, qui lui succède, parle à son tour de l'irrigation. Après eux, MM. Reifenberg et Aubert font part de leurs observations.

Suit la discussion des rapports à laquelle participent notamment MM. Gaucher, chef du bureau scientifique du paysannat marocain ; Kellog (U.S.A.), Monjauzé, Gauthier et Borda.

M. SICARD

Le président déclarant close la discussion, M. Sicard se lève et souhaite la bienvenue aux éminents congressistes. Il déclare que le fait d'avoir choisi cette salle de séances constitue un hommage à la masse des colons et fellahs qui ont accompli en ce pays une œuvre immense :

— Permettez-moi de vous exprimer, Messieurs, conclut-il, toute ma gratitude. Nous sommes touchés, croyez-le, de voir que des savants comme vous pensent à nous aider dans notre tâche et à nous fournir les moyens de fixer au plus tôt, dans une atmosphère rénover, la possibilité de vivre dans l'aisance comme avant-guerre. Nous souhaitons aussi que dans cette paix universelle

nous fassions prospérer les cultures magnifiques qui rendront à l'humanité le bonheur auquel elle a droit »

De vifs applaudissements saluent la péroraison du Président de la Chambre d'Agriculture d'Oran.

L'on se sépare ensuite pour assister au banquet offert aux congressistes, dans les salons du « Martinez » par la Chambre d'Agriculture et la Fédération des Syndicats agricoles..

LE BANQUET

Les mêmes personnalités du monde scientifique et agricole se retrouvent autour de tables où fleurs et cristaux font une parure du meilleur goût. Un menu d'un rare cachet culinaire est servi, qui maintiendra auprès de nos hôtes étrangers le prestige de nos plats réputés et de nos vins d'Oranie.

Au dessert, M. Sicard sait trouver les mots qui conviennent pour remercier les éminents savants dont le séjour sur cette terre constitue le plus bel hommage rendu au génie de la France et des pionniers qui l'ont concrétisé « car les victoires ne se gagnent pas, ajoute l'orateur, seulement sur les champs de bataille, mais parfois sur les champs tout court ». Il a un mot aimable pour chacune des nations amies représentées et demande à leurs délégués de dire bien haut ce que les Français ont entrepris et réaliser sur cette terre autrefois inculte.

MM. Barbut et Demolon expriment également leur foi dans les destinées de notre province. Puis MM. Ogg, pour la Grande-Bretagne ; Kellog, pour les U.S.A., Lefèvre pour la Belgique, Reifenberg pour l'Etat palestinien et Bramao pour le Portugal, expriment en des termes différents les mêmes sentiments d'amitié envers notre pays. Le délégué norvégien, M. Nordhagen avoue qu'il aime cette contrée parce que de là sont parties les armées alliées qui ont rendu la liberté à sa patrie et à l'Europe.

MM. Tinthoin et Ganancia excusent respectivement le Préfet et le Maire d'Oran, retenus par leur charge, et félicitent les savants de leurs travaux. Puis M. Sicard met le point final à cette belle manifestation en envisageant les splendides résultats que peut engendrer, sur le plan humain, une entente comme celle qu'ont réalisée, dans le domaine de la science, ces hommes de bonne volonté, au grand cœur et aux nobles pensées. — F. E.

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ECHO

HEMERIDES

du 20 mai 1947, 140^e jour de

hivalter : Saint Bernardin.
Le 4 h. 56; coucher 19 h. 03.
Le 20; PQ le 27.

MÉTÉOROLOGIE

née du 19 mai

ORAN

1 : max. 93% à 3 h.; min.

sol, le matin secteur Ouest,

La saison sur



La Conférence internationale de Pédologie

(Suite de la première page)

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LE BANQUET

Les mêmes personnalités du monde scientifique et agricole se retrouvent autour de tables où fleurs et cristaux font une parure du meilleur goût. Un menu d'un rare cachet culinaire est servi, qui maintiendra auprès de nos hôtes étrangers le prestige de nos plats réputés et de nos vins d'Oranie.

Au dessert, M. Sicard sait trouver les mots qui conviennent pour remercier les éminents savants dont le séjour sur cette terre constitue le plus bel hommage rendu au génie de la France et des pionniers qui l'ont concrétisé « car les victoires ne se gagnent pas, ajoute l'orateur, seulement sur les champs de bataille, mais parfois sur les champs tout court ». Il a un mot aimable pour chacune des nations amies représentées et demande à leurs délégués de dire bien haut ce que les Français ont entrepris et réalisé sur cette terre autrefois inculte.

MM. Barbut et Demolon expriment également leur foi dans les destinées de notre province. Puis MM. Ogg, pour la Grande-Bretagne ; Kellog, pour les U.S.A., Lefèvre pour la Belgique, Reifenberg pour l'Etat palestinien et Bramaou pour le Portugal, expriment en des termes différents les mêmes sentiments d'amitié envers notre pays. Le délégué norvégien, M. Nordhagen avoue qu'il aime cette contrée parce que de là sont parties les armées alliées qui ont rendu la liberté à sa patrie et à l'Europe.

MM. Tinthoin et Ganancia excusent respectivement le Préfet et le Maire d'Oran, retenus par leur charge, et félicitent les savants de leurs travaux. Puis M. Sicard met le point final à cette belle manifestation en envisageant les splendides résultats que peut engendrer, sur le plan humain, une entente comme celle qu'ont réalisée, dans le domaine de la science, ces hommes de bonne volonté, au grand cœur et aux nobles pensées. — F. E.

emphasizes the particular importance of erosion control to preserve the Terra Rossa which, he thinks, are even now in process of formation.

Aubert speaks of the soils with calcareous horizons. He addresses part of his remarks to the question of whether the *croûte calcaire* is a pedological or geological phenomenon. He points out that it is found on many kinds of rocks and under a wide range of relief. Generally, he thinks of the *croûte calcaire* as pedological. Some maintain that it is formed by leaching from the surface; whereas others maintain that it is formed at the surface of a water table. Aubert thinks that the *croûte calcaire* is most commonly developed by concentration of lime from ascending waters. But he recognizes that other processes may be involved. According to Aubert, *croûte calcaire* may be formed at the surface of lower rock layers (?). He points out that fossil crusts of *croûte calcaire* exist, of course, as do other fossil soils and fossil soil horizons.

There is quite an extended discussion following Aubert's presentation. M. Ferriere ridicules Aubert's statements with poor taste and worse logic. Professor Norghaden of Norway, believes more effort should be made to produce the *croûte calcaire* experimentally. Mr. Schofield of Rothamsted, suggests that plant roots may have an important influence in the upward movement of calcium which may then be deposited in the lower root zone.

Professor Joffe of New Jersey, raises the old question: if the calcium carbonate accumulates by upward movement of water, then what becomes of the other material? He says that the only possibility is a semidesert crust at the surface.(??)

Much of the discussion on this point is not worth recording, and presumably, the series of statements will be published in the proceedings of the Conference.

M. Gaucher discusses the origin of salty soils. He points out that those in France are of marine origin, while those in Algeria are chiefly of continental origin during Miocene and Quaternary periods. In the alluvial valleys, a part of the salts now causing trouble comes from the irrigation water, but most rise with the upward movement of water from the water table. There are also expansions of areas of salty soils through inundations. The important salts they have to contend with are sodium chloride, magnesium chloride, and calcium sulphate. Sodium carbonate is very rare. Thus most of their salty soils are Solonchaks. I believe this to be correct. We saw nothing approaching a good Solonetz on the trip.

Demolon urges that I make a summary of my observations and as many specific suggestions as is possible. These remarks follow.

"First of all, I want to express my personal thanks for the excellent opportunities for study and exchange of views made possible by our French colleagues. Certainly this Conference has been in the best tradition of French culture. Frankly, I fail to see how such excellent arrangements could have been made and carried out so smoothly in these times of adjustment after the world's most cruel war.

It is difficult to make useful comments on the work we have seen so briefly. One must deal largely in generalities, especially anyone with such limited experience in the Mediterranean region as myself. Further, it is clear by now that my interest is as much in the application of soil science to the practical tasks of food production and soil improvement as in the fundamental research essential to such applications.

As we went over the area a few suggestions, or rather questions, arose in my mind:

1. How about more use of the new strains of millet and grain sorghums for food and animal feeds in the dry areas that cannot be irrigated?

2. Does not some examination need to be made of optimum plant spacing for various soils and management systems, especially in relation to irrigation? The spacing seems nearly uniform now under a wide range of conditions.

3. One is always inclined to question as much monoculture as we've seen, and wonder whether some mixed cultures, where ordinary rotations are impracticable, could not be developed that would improve the soil and increase total production. Such systems might or might not involve some livestock production along with grape culture.

4. The erosion problem is acute in places, although it can, by no means, be assumed that all hillsides with thin, stony soil are erosion remnants from better days. In some situations, deep soil has probably never existed; as over porous rocks where the fine products of weathering go deeply into cracks and subterranean caves, for example.

In many places it is obvious that controlled grazing, controlled cutting of shrubs and trees, and prevention of fires are absolutely essential first steps for soil conservation and improvement. These matters touch highly important social and administrative problems. I shall not try to deal with them, except to emphasize that they must be dealt with if the population of certain areas is to continue to exist there. They will not get easier through neglect or postponement. Quite the reverse. Soils scientists must urge their importance.

We have seen good work with terraces, countour strips, and small dams. It is obvious that well qualified technicians have been at work. Certainly attention needs to be given the

costs of such improvements and how these costs should be allocated to the various interests benefiting from them, including city industries and harbors, as well as rural people.

5. The problems of irrigation here in Algeria are numerous. There are questions of the optimum amount of water to use; that is, too little on a large area may be as wasteful as too much. Perhaps a lot could be gained of prediction value by using some physical tests of soils, as well as chemical ones, for estimating their suitability for irrigation.

Then too, the relative costs of the several alternate methods of handling the water need careful comparative analysis.

6. One wonders whether fertilizers cannot be even more useful. Some combined studies of soil moisture, fertilizer treatments, and plant spacing might be very helpful for developing more efficient practices. Perhaps more attention needs to be given the minor elements, especially with intensive production of fruits and other crops in monoculture under irrigation.

7. On the problem of calcareous crusts I can only say now that their precise origin under all cases is not satisfactorily clear to me. Whether we call them pedological or geological is largely a question of semantics. Certainly they are characteristic of warm subhumid and semiarid treeless regions. Some we find are no doubt fossil; others are

currently in formation. Nor can we expect that all were formed in exactly the same way.

8. It seems to me that the Terra Rossa is related to climate, and in that sense a zonal great soil group, and also to certain kinds of rocks rich in the alkaline earths, and in that sense an intrazonal great soil group.

9. It is difficult to understand soils, if not impossible, until the various kinds have been identified through detailed study of their profiles and environments, over the range of the relevant local topographic and geological conditions where they occur, and their boundaries carefully plotted out in considerable detail. For reaching that understanding of soils needed in soil classification, profiles near together over the range of slope from one hilltop, across the valley and up to the opposite hilltop, are necessary on the various kinds of rock materials. A soil is a three-dimensional landscape -- often a micro-landscape -- that needs to be studied in relation to all the landscapes that join it to understand it."

M. Monjauze discusses the problem of soil conservation. He points out the seriousness of the situation, especially in the northern steppe region. Of 26 million hectares, $2\frac{1}{2}$ million are in state forests, $2\frac{1}{2}$ million are held by the French, and 21 million are in the hands of the native Arabs. Practically all of this 21 million is in need of special

measures for erosion control, along with about 1 million hectares held by the French. With 100 tractors he feels that the work could be done on the 1 million hectares held by the French in ten years, because most of those farmers are anxious to do all they can themselves. But the problem is very difficult on the 21 million. There are great social and administrative problems in the matter of controlled grazing, and so on. The only effective approach is to work through the native chiefs, some of whom cooperate with the French well, whereas others have a deep hatred of the French and are difficult to deal with. So far only a small start has been made in the program that is so urgently needed. With all of this I can agree. The erosion situation is critical. I think the agricultural specialists in Algeria know what to do; the limiting factor now is mainly in the field of administration.

M. Gautier gives a brief discussion of the geology of soils, and points out the importance of soil science in the study of irrigation. He feels that many soil scientists do not make as effective use as they might of the older geological work already available. He feels that pedologists need to devote more attention to the definition of their terms so that they may be better understood.

M. Bordas raises the question as to whether there should be an international society for the study of Mediterranean soils

and he proposes a more or less conventional program for such a study. He says that this was attempted a few years ago, but the attempt was frustrated by the war. If such were developed, should geologists, agronomists, and other scientists be included? Well, his questions weren't answered, but I think most of the soil scientists feel we should first concentrate on developing the International Society of Soil Science again, and after that there may be occasion for regional groups within the International Society.

The session closes at 12:30 noon, and we go to a very elaborate luncheon that lasts for a long time, and has a great many pretty speeches. I am glad that these speeches are over with because I have about used up my appropriate material regarding the history of French science and culture.

We all go to Cook's Travel Agency to get our tickets and sanitary documents for leaving tomorrow. I then go back to my hotel and wrap soil samples until 7 o'clock. Dinner is announced for 9:30, but since I have 3 oranges I decide on saving 2 for breakfast and using one for dinner. So I go to bed at 10 o'clock.



MENU

CONFERENCE MEDITERRANEENNE DE PEDOLOGIE

DEJEUNER DU 19 MAI 1947

" LE MARTINEZ " - ORAN

M E N U

HORS D'OEUVRE

Jambon d'York, ramequins au fromage, quiche lorraine, salade de pommes et choux-fleurs, radis.

LE MEROT à l'AMIRAL

LE POULET SAUTE CHASSEUR

LES ASPERGES d'ARGENTEUIL SAUCE VIERGE

LE ROTI DE veau AVEC POMMES DAUPHINE

SALADE COMPOSEE

LA COUPE DE GLACE MERINGUEE

FRUITS d'ALGERIE

VIN BLANC & VIN ROUGE d'ORANIE

CHAMPAGNE - CAFE - LIQUEURS

Après votre repas, buvez une

VIEILLE CURE

LA GLOIRE DES GRANDES LIQUEURS FRANÇAISES

See over



May 20: Leave Oran

I am up early to finish the last of the soil samples and pack my luggage for the trip back to France. At 8 o'clock we go by bus from the hotel to the docks. Cook's have the arrangements in hand, and they are by far the worst I have ever seen. No porters or other services have been provided. I go through a terrific crowd -- the worst that I have ever been in -- carrying over 80 pounds of baggage. My poor back! It is simply a terrible jam. The boat is the same one that we had for the passage to Algiers -- the Ville d'Oran. The boat is terribly crowded. All berths are taken and, in addition, many passengers simply stay on the deck without berths. There is a great mixture of all sorts of people.

We leave about noon. I spend the afternoon in discussions with Aubert, Muir, and others of our conference.

May 21: Arrive in Marseille, leave for Paris

What a boat! There was no drinking water for my aspirin last night and my back was terribly sore because of the hard wrestle with my baggage yesterday. Then in addition, there were two hard snorers in my cabin, so I had very little sleep. But I have a good breakfast -- quite a bit more than the usual "café complet."

This is a cool, gray day. So far, the "sunny days" of southern France seem scarce.

A little before noon the sea becomes very rough indeed, and very many passengers are sick. In fact, they are groaning all about, and soon the decks and stairs are literally slippery. The strong head wind delays the boat and we shall be late. At 4:30 we all bring our baggage into the main saloon. Yet the boat doesn't arrive at the dock until about 6! Then again this unbelievable confusion -- people and baggage all mixed up. At first it doesn't seem that anything will ever be straightened out in this French port, but somehow it is. We finally get to the train and find again that there are no sleepers, only couchettes. I go over for supper at a little restaurant along the water front. The train finally pulls out for Paris at 9:30 p.m.. We shall need to sit up all night.

Despite some inconveniences the French have really done a good job with this Conference considering the shortages in the country. Not until after the Conference was well under way did I realize that the towns where we staid paid many of the expenses -- hence the many official receptions. Really I don't see yet how the French soil scientists managed this whole expensive excursion so well so soon after the war, in the face of shortages of transport, food, and about everything, to say nothing of political confusion.

A little before noon the sun became very warm, and very many passengers were sick. In fact, they are getting all about, and soon the decks are being used literally as a hospital. The strong head wind blows the boat and we still go on. At 4:30 we all bring our baggage into the cabin below. For the boat doesn't arrive at the dock until about 5:15. Then again this terrible condition -- people and baggage all mixed up. At 5:15 it doesn't seem that anything will ever be straightened out in this French port, but somehow it is. We finally get to the train and find again that there are no tickets, only confusion. I go over the paper at a little restaurant along the way from the train finally gets out for Paris at 5:30 p.m. We shall need to sit up all night.

Despite some inconvenience the French have really done a good job with this Conference considering the situation in the country. Not until after the Conference was well under way did I realize that the laws were so strict with regard to the expenses -- hence the very careful accounting. I don't see just how the French will maintain such a whole expensive excursion so well as they did the war, in the time of shortage of resources, food, and almost everything, in the running of political institutions.

May 22: In Paris

Daylight comes a little before 7 o'clock and we are about $4\frac{1}{2}$ hours from Paris. The morning is gray but gradually becomes more sunny. We arrive in Paris at 9:55. Neither Pendleton nor I can get a taxi but are finally able to hire a porter to carry our heavy luggage, and we go by subway to the Hotel Vouillemont, near the Embassy. We leave our luggage in the room and go to the Embassy for a conference with Thibodeaux. We have lunch in the Embassy cafe. Immediately after lunch we go to the conference about the International Society of Soil Science at 14 Avenue de St. Mande.

Paris meeting to consider organization of an International
Congress of Soil Science 1/

This is held in the School of Forestry where Mr. Oudin has his laboratory. The meeting comes to order at 3:15.

Present are: Oudin, from France, Edelman and Zuur, from Holland, Pendleton and Kellogg, from United States, Walter Russell, from United Kingdom, Reifenberg, from Palestine, and Hissink, from the old International Society.

I open the discussion with^a summary statement of the interests and tentative proposals of the Soil Science Society of America, and of my instructions from them. I point out that the main purpose is to decide upon a time and place for the next International Congress, and that the details of organization of a new or revised International Society of Soil Science should be decided then. Thus the next congress should be divided into two general parts: (1) A program of scientific papers, including also symposia, and (2) a session for the discussion and adoption of a new constitution for the Society, the election of permanent officers, determination of the kinds of publications, and similar matters. Therefore, the task today is primarily one of assuming responsibility for deciding upon the place and time of the next congress. Of

1/ Since I acted more or less as chairman of this meeting, the notes which follow are based in part on those taken by Dr. R. L. Pendleton.

course, full advantage should be taken of all previous experience. The group here today is not sufficiently representative to go further; any proposed constitution can only be considered properly by a much larger and more representative group. There are several serious problems. For example, the problems of soil scientists in big countries are different from those in small countries with only a few soil scientists. Then there is the problem of enemy nationals.

Edelman pointed out that official invitations to enemy nationals are scarcely possible for the next congress.

I also summarize my discussions with responsible people in the FAO about their interest and willingness to give moral support to the organization of an International Congress of Soil Science. The FAO is in position to emphasize the importance of a meeting to the ministers in small countries.

We have some discussion about enlarging our committee and the difficulty of naming individuals among soil scientists in particular countries where there is no operating society of soil science. It is agreed that an advisory committee representing some 14 or 15 countries might be helpful.

Edelman presented an official invitation from Holland that the next International Congress of Soil Science be held there. If this is accepted the Dutch Government will issue invitations through the usual channels.

Hissink states that soil scientists in the little countries would like to have a meeting as soon as possible. I point out that considerable time will be required to organize a congress because of the delays of overseas correspondence and the time required for authors to submit papers, and the possible delays in getting them printed in advance. It seems better to delay it until 1950 and have a first-class congress with many representatives. Hissink admits that printing and the other tasks will require considerable time. I also stress the importance of having the congress run as inexpensively as possible so that the young scientists may attend in considerable numbers.

Hissink observes that there are to be international congresses in other fields in 1948 and 1949, as well as in 1950. Russell suggests that we accept the invitation of the Dutch without emphasizing 1950.

Edelman states that a congress in Holland should need to be held in Amsterdam where facilities are more ample than in the Hague.

A general discussion brings out the fact that July would likely be the best month for a congress, with August as a second choice.

There is a good deal of discussion about the mechanics of organization, and Edelman agrees that the local Dutch committee will take this responsibility.

Russell raises the question as to whether or not the Dutch should like to have suggestions in detail. It is felt that the Dutch should carry the full responsibility, but with such cooperation and advice from people in other countries as they may find appropriate to request. There is a good deal of discussion about the relation of this temporary committee to the old society, and it is agreed that it should be abundantly clear that this committee is not representative of the old International Society. Edelman asks about the president of the congress. Russell and the others feel that the Dutch should probably name the president and be free to make all arrangements and plans. I emphasize that the responsibility for the congress is with the Dutch.

Oudin suggests that the name of the proposed 14 nation advisory committee might be "temporary advisory committee for the congress." I suggest that this proposed committee might have two duties: (1) Advise the Dutch regarding any matters that might be brought before the committee, and (2) to develop suggestions for a constitution and other organizational features. I emphasize that there is no decision one way or the other about the Russian proposals. Of course, they should

be sent copies of the conclusions of this meeting as well as people in other countries. Oudin feels that the soil scientists in the Soviet Union will be in agreement with our present proposals, since no commitments are made regarding the future organization. In response to the question from Zuur it is suggested that no invitations to the congress be sent to Germany, Japan, Spain, Italy, and Austria. But this may need modification. Edelman suggests that when the peace treaties are signed the Dutch may find it necessary to seek advice from the advisory committee about invitations. Russell emphasizes that such advice should be public, and that it likely will not be necessary for the advisory committee to meet, but they will need a secretary. Probably some national representative should be asked if his section could furnish a secretary for the committee. This committee would have some work in preparing the agenda for that part of the congress devoted to the organization of the International Society of Soil Science. Oudin suggests that a president for the advisory committee may not be needed until the congress meets. I throw out the suggestion that Dr. Ogg indicated tentative agreement for Dr. Alex Muir to serve as secretary if it were the wish of the group. Rothamsted is a central location for the correspondence and Muir is familiar with the European languages, including Russian.

Russell agrees that perhaps he may wait until the congress for selection of a chairman for the temporary advisory committee.

Hissink suggests that UNESCO might not have any interest in the International Society of Soil Science. I point out that we must maintain complete independence from other international organizations, but should cooperate with agencies like FAO on matters of mutual interest. Hissink asks about financial arrangements, costs of printing, and so on. It is pointed out that commitments made to him by the old society still hold, although we shall recommend that no more dues be paid.

Russell states the belief that the main function of the International Society of Soil Science should be to hold congresses, and that the congresses should be supported by registration fees and subscriptions by those who take part in them.

Edelman suggests that it should be possible to have the congresses self-supporting. I point out that these fees, or part of them, might be collected in advance. Russell points out that the remaining funds in the old International Society could be allocated for use in 1950 but not before then.

Hissink reports that the book fund at the present time amounts to about 40,000 guilders in cash. He explains that he has been secretary for 25 years but has been paid nothing.

At the start he had facilities from his institute, and that in 1939 he was pensioned. He asserts that the cost of the office of the old International Society of Soil Science must be paid by someone. Before the war the executive committee of the Society authorized his making expenditures for these purposes and they have been made since. These include a house in Bossum, heating, and clerical assistance. Russell points out that since these expenditures were authorized by a properly constituted committee of the International Society of Soil Science there is no authority to cancel the authorization, and likely not to be any prior to 1950.

Hissink asks about membership fees collected in 1939 and later. In the United States and in the Soviet Union he says these funds are being held and not being forwarded to him. The book fund remains. There should be enough cash to cover the annual expenses on the scale authorized. Russell agrees, and says that in 1950 if the Society is properly reconstituted new decisions can be made. At the present time there is not a valid constituted executive committee to issue new instructions to Hissink.

Obviously Hissink doesn't like all of this. He says he hopes to live until 1950 but is an old man. In 1950 he intends to abdicate, he says "but why not earlier?" But then he goes on to say that his office can serve as a link between

the old Society and the new Dutch organizing committee.

Russell points out that the British Soil Science Society recommends that no more publications be issued by the International Society, nor more subscriptions collected, until the Society is reorganized at the time of the 1950 Congress. The meeting temporarily adjourns while 2 or 3 of us prepare a written statement. This is agreed to and proper copies are signed by all those present. The copy as signed is as follows:

- I. It is decided that we should have an International Congress of Soil Science with two parts:
 - a) a program of technical and scientific papers, and
 - b) a meeting to adopt a new constitution for an International Society of Soil Science.
- II. A temporary advisory committee is constituted by representatives of the soil scientists of 14 Nations as follows:

Australia	South Africa
Denmark	Sweden
France	Switzerland
Holland	Tchecoslovakia
India	United Kingdom
Palestine	United States
Poland	U. S. S.R.

Dr. Muir will be invited to be secretary. No president need be appointed in advance of the Congress meeting. This committee will eventually give any suggestions to the organizing committee of the Congress that they require.

- III. The Dutch Government invites the next International Soil Congress to Holland in 1950. This invitation is accepted. The Dutch organizing committee will make all necessary decisions and takes all the responsibilities. If necessary, the Dutch committee will ask the advice of the temporary advisory committee mentioned in point II. Former enemy-nationals are excluded from the Congress.

- IV. The Congress will decide freely the organization of the future Soil Science Society. The temporary committee of point II will prepare the necessary proposals and agenda for discussion and action in 1950.
- V. The present committee recognizes its incompetence to deal with questions of the old International Soil Science Society. It suggests that no more publications be issued or membership fees collected before the Congress of 1950.
- VI. It was regretted that representatives of other countries who had hoped to be present were unable to attend. Insofar as we know, the decisions taken are consistent with the principal views expressed.

After the conclusion of the meeting Pendleton and I just have time to reach Aubert's home for dinner. We have a most excellent dinner. Besides Aubert's wife both his father and mother were with us. His father is a very distinguished looking Frenchman who has lectured widely at American universities on the history of art and similar subjects. Aubert has 5 healthy looking small children.

I return to the hotel at 11:00 p.m., dead tired.

stop and
go to
page
12

but

May 23: In Paris

Immediately after breakfast Pendleton and I go to the Embassy in order to sort out our materials and arrange for their disposition. Unfortunately, Mr. Thibodeaux forgot to bring the materials that he had at home so that we shall need to wait until after lunch. We go to the American Express and order tickets for Brussels and change Algerian money and dollars to French money. On the way back I call at many, many stores before I find 2 pairs of full-length white kid gloves ordered by my women folk.

Back at the Embassy after lunch I work on the soil samples. I finally get these all wrapped up and packed for forwarding through the diplomatic pouch to the United States. Many of the books and papers, and a few other materials no longer needed are wrapped for sending also. Pendleton agrees to take the film with him. I just get finished under the wire. Here it takes an amazingly long time to get a little work done.

In the evening ^{of May 23,} Hissink and Zuur call at my hotel. Hissink insists that the American Society should notify each individual old member of the International Society of Soil Science of the decisions taken. This doesn't seem necessary to me, but I point out I shall discuss it later with Walter Russell. Hissink also suggests that Vilensky should share the secretaryship or the chairmanship. I am uncertain about this and also agree only to discuss it with the English at Rothamsted.

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May 24: In Paris

This is a holiday in Paris. In the morning I go to the American Express, which happens to be open, and get my tickets for Brussels. Except for a little time among the book stalls I spend most of the day resting and clearing up some of my records.

May 25: Sunday in Paris

I take a walk in the morning and go out to St. Germain for lunch. After lunch I stroll around the park and return early in the afternoon to my hotel. In the evening Pendleton and I have dinner with Mr. and Mrs. Thibodeaux, along with Mr. Riddell, Agricultural Attaché at the Hague, Rex Johnson from OFAR, and others. It was a very pleasant evening.

May 26: In Paris

This is another holiday for France -- just like another Sunday. In the early morning Pendleton and I go far out on the edge of town to visit an old book dealer. In the afternoon I rest, write notes, and that is all.

P-LIX B



May 25, 1947.

A view of Notre Dame in Paris. (Photo by Pendleton.)



Map 8
General Map
London
Paris
Brussels



AERONAUTICAL CHART SUPPLY

(Ref: AAF Reg. 65-82, dated 26 Apr., 1944)

Aeronautical charts, maps and publications distributed by Aeronautical Chart Service are indexed or listed in the edition of the AAF "Catalog of Aeronautical Charts and Related Publications." Miscellaneous maps and charts not in the Catalog will be procured and furnished by Aeronautical Chart Service through special order, when sufficiently in demand as to name or number, scale, projection, and publisher if known.

Requisitioning.

a. Outside Continental United States:

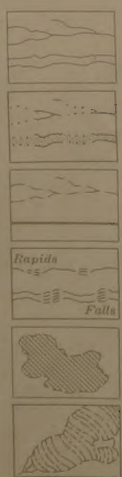
- (1) AAF activities are to submit requisitions to the supply facility designated by the Theater Commander for maintenance and distribution of aeronautical charts and maps.
- (2) Theater supply facilities are to submit requisitions for replenishment of stocks of aeronautical charts and maps through channels to Headquarters AAF, Aeronautical Chart Service, Washington, D. C.

b. Within Continental United States: Requisitions from AAF activities within Continental United States are to be submitted to appropriate Regional Store as shown on Aeronautical Chart Supply System geographic diagram in AAF Aeronautical Chart Catalog. Except when emanating from an Air Force, Wing, or Command Headquarters, requisitions are to be signed or approved by indorsement of the Base or Station Operations Officer. Quantities of charts and maps are to be such as to assure the maintenance of a 30-day supply at all times but not to exceed a 60-day supply.

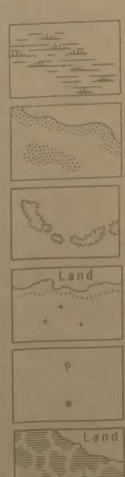
Obsolete Charts.

a. Aeronautical charts rendered obsolete-for-air by a revised edition, when not practicable to correct for conformity with provisions of AR 380-5.

HYDROGRAPHIC FEATURES



PERENNIAL STREAMS & RIVERS
SINGLE LINE
DOUBLE LINE
INTERMITTENT STREAMS & RIVERS
SINGLE LINE
DOUBLE LINE
PROBABLE DRAINAGE, UNSERVED
CANALS
RAPIDS & FALLS
INTERMITTENT LAKES
GLACIERS



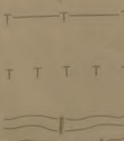
SWAMPS & MARSHES
SHOALS, REEFS, LEDGES, SAND BARS, ETC.
(AREA BETWEEN HIGH & LOW WATER LEVEL)
SMALL CORAL ISLANDS
(AREA EXPOSED AT HIGH WATER LEVEL)
ONE FATHOM LINE
(6 FT. BELOW LOW WATER LEVEL)
CHARTED ROCKS
SPRINGS
WELLS & WATER HOLES
MUD & TIDAL FLATS
LOCATED OBJECTS

TOPOGRAPHIC FEATURES



HACHURES
(ELEVATION IN FEET)
SAND AREAS & SAND DUNES
SAND RIDGES
LAVA FLOWS

CULTURAL AND MISCELLANEOUS



POWER TRANSMISSION LINES
TELEPHONE & TELEGRAPH LINES
DAMS
LOCATED OBJECTS

CITIES AND TOWNS

HIGHWAYS AND ROADS

May 27: Paris to Brussels

Pendleton and I are up at 7 o'clock and at the Gare du Nord at 9 o'clock for the Brussels train. I am going as a guest of INÉAC as arranged before leaving Washington. Pendleton expects to spend a couple of days in order to meet the people in INÉAC and Professor Baeyens of Louvain University. We cross the border at about noon, and arrive in Brussels at 1:30

Notes on my visit in Brussels and the Belgian Congo as a guest of INÉAC and the Belgian Government are included in the Congo Journal. The present record picks up again after the conclusion of my visit with the Belgians.

July 13: Arrival in Harpenden

I leave Brussels at 11:41 a.m. and am down at the Heathrow Airfield at 2:07 London time. This field is some distance from the central part of the city. Coming in on the plane I notice simply thousands and thousands of little gardens behind row houses. Each has a border of small trees, shrubs and perennials, with vegetables and a tiny patch of lawn in the center. On the bus into Victoria Station I see a good deal of damage from the blitz. Most of the debris has been carried away, but one sees many partly demolished buildings and a great many vacant places. Contrary to the reputation of the English, my companion in the bus seat is very friendly. He explains much about the city as we pass along. From Victoria Station I take a taxi to the bus station opposite St. Pancras Railroad Station. The bus leaves at 4:00 p.m. and I reach Harpenden at 5:10 p.m. Also on this bus my traveling companion --^aresident of Harpenden^a is very friendly and helpful.

Dr. Muir and his daughter meet me at the bus shelter in Harpenden and I go to his home. I spend a very pleasant evening with his family and get to bed fairly early.

July 14: At Rothamsted

In the morning I visit some of the laboratories at Rothamsted. Mr. Schofield shows me the current work in his laboratory where men are studying (1) negative absorption with jute, (2) migration of ions in bentonite suspensions, and (3) volume weight and water losses from soil clods using purified kerosene. Schofield says that in the local soil -- clay-with-flints -- when the water leaves, the clods simply shrink and the air goes into the cracks.

Right near the buildings there is a deep ditch in this soil -- clay-with-flints. I try a photograph. Likely this land was farmed by the Romans and most of the time since then. The surface 10 inches is a medium to dark gray clay loam. Beneath is yellowish-brown stony clay to about 20 inches. This gives way to dark brown, heavy stony clay. At unequal depths from only a little more than a foot to nearly 12 feet there is fine cherty chalk. The soil profile has likely been influenced considerably by some glacial sludge deposited over the chalk.

I also look over the greenhouses and some of the other laboratories.

July 15: At Rothamsted

Crowther takes me on a rapid tour of the plots at Broadbalk field where I get several photographs. Wheat has been growing on this field for 104 years. I am not taking detailed notes because all of the treatments and layouts are summarized up to date in a recent publication of the Rothamsted Station, which Crowther gives me. I go to lunch with Mr. Schofield. After lunch I go over briefly my notes and pictures from the Congo with Crowther, Muir, Schofield, and Russell. We also discuss the tentative arrangements for the new Congress scheduled for Amsterdam in 1950. We agree that it is unnecessary to go to all the trouble and expense to send a letter to each member of the old Society, and that the publication of the announcements in the various journals will be enough.

After tea time I give a talk to the staff at Rothamsted on the organization and scope of agricultural research in the United States.

During the day whenever there is an opportunity Crowther raises many questions about our soil classification in the United States as related to his attempt to correlate climatic conditions with the occurrence of the zonal soil groups. Unfortunately, he has been put to a lot of trouble because of the printer's error in Soils and Men that did not show the



K-1469 July 15, 1947
 England. Rothamsted. Broadbalk field. Looking
 across fallow to plots immediately after fallow.
 Right, after manure, and left, no manure. Cropped
 for 104 years.



K-1470 July 15, 1947. England. Rothamsted.
 Broadbalk field. Close view of plot with no manure,
 continuous wheat for 104 years. Second year after fallow.
 (Note wild legume ground cover.)



K-1471 July 15, 1947 England. Rothamsted.
End of Broadbalk field, not cropped since 1882. In foreground are grasses and weeds maintained by grubbing out all trees and shrubs. Background is area regenerated by trees and shrubs that have come in by themselves.



K-1471a July 15, 1947. England. Rothamsted.
Crowther standing by unmanured plot first year after fallow. Cropped for 104 years.



K-1535 July 14, 1947. England. Rothamsted.
Broadbalk field. Looking across fallow toward plots the first year after fallow. Right, after manure; left, no manure. Cropped for 104 years.



K-1536 July 14, 1947. England. Rothamsted.
Broadbalk field. Looking across fallow toward plots the first year after fallow. Right, after manure; left, no manure. From between similar plots second year after fallow. Cropped for 104 years.



K-1537 July 18, 1947
England. Rothamsted. Broadbalk field. Looking
across fallow toward plots the first year after
fallow. Freshly cultivated fallow showing surface
of "clay-with-flints."

Prairie and Reddish-Prairie soil groups as transitional between Marbut's Pedocals and Pedalfers.

In the evening I have dinner with Director Ogg and his family.

July 16: Near Rothamsted

This morning Muir and one of the chemists in Mr. Crowther's department take me for a drive in the neighborhood of Harpenden.

At the first stop we look at a soil profile developed on flinty valley gravel about 3 miles south of Harpenden. Although the soil has probably not been farmed the surface has been disturbed. Muir would be inclined to include this profile with the Brown earths, but we should include it with the Gray-Brown Podzolic.

We stop to look at the ruins of an old Roman theater near St. Albans located on the old estate of Sir Francis Bacon.

Not far away we look at a soil regarded as transitional between a real Rendzina and clay-with-flints, likely developed from a thin glacial sludge over flinty chalk. The whole soil is exceedingly stony, with small, cobbly flints. It is more or less calcareous throughout. The surface 7-8" is a very dark gray clay loam, underlain by grayish-brown, with good angular nut structure.

We drive by an old woodlot that seems never to have been cultivated. The area has been used for a park and as a training station during the war, so the surface is quite disturbed. Both the A_0 and A_1 are nearly black and very thin. A thin A_{20} suggests a slight tendency toward the color and structure of the A_2 of the Podzol. The real A_2 is about 8 to 10 inches thick and consists of light yellowish-brown silt loam with a suggestion of platy structure. The A-B transition is about 3 to 4 inches thick. The B_2 at 12 to 24 inches, is a yellowish-brown clay, with an angular nut structure. The soil contains many flints. This grades into the B_3 horizon having larger aggregates and some reddish-brown mottling.

As we drive along the road I see some cultivated fields on thin chalk that are nearly white and have a pH up to 8.4. Yet these fields are said to grow good crops of potatoes (!) and barley with some fertilization, especially potash.

We look at a Rendzina on the escarpment of Chiltern Hills. The slope is about 40 percent and the surface has an old turf mainly of short grasses. Muir regards this as a typical Rendzina.

A₁ 0-9" Dark grayish-brown silt loam, rich in very fine sand. Small, hard, slightly angular granular structure. Aggregates held together by grass roots.

D 9" + Nearly white, brittle chalk, cracked into small and medium irregular blocks.

We stop in for a look at the Woburn Laboratory. One might expect Lawes or Gilbert, or even Liebig himself, to crawl out from under the benches. The equipment and methods of the laboratory suggest a period of many, many years ago. The nitrogen determinations are being made by steam distillation using little kerosene heaters; the still is operated by coal. We discuss the work at the laboratory for a few minutes and then go out to look at the soil on the station. Whereas the soil at Rothamsted is heavy, here there is a sandy soil developed from rather poor quality greensand.

A_p 0-7" Dark yellowish-brown sandy loam. Friable, but firm in place when dry.

B 7-18" Light yellowish-brown, friable light sandy loam.

B₃ 18-24" Transitional.

C 24" + Stratified, yellow and grayish-yellow sand, with some relict layers of thin, brittle ironstone.

Some of the soil is undulating and some is gently rolling.

In cultivated fields the soil has a reddish-brown color.

On the way back to the station we look hurriedly at a soil developed from "chalky boulder clay" (=calcareous till).

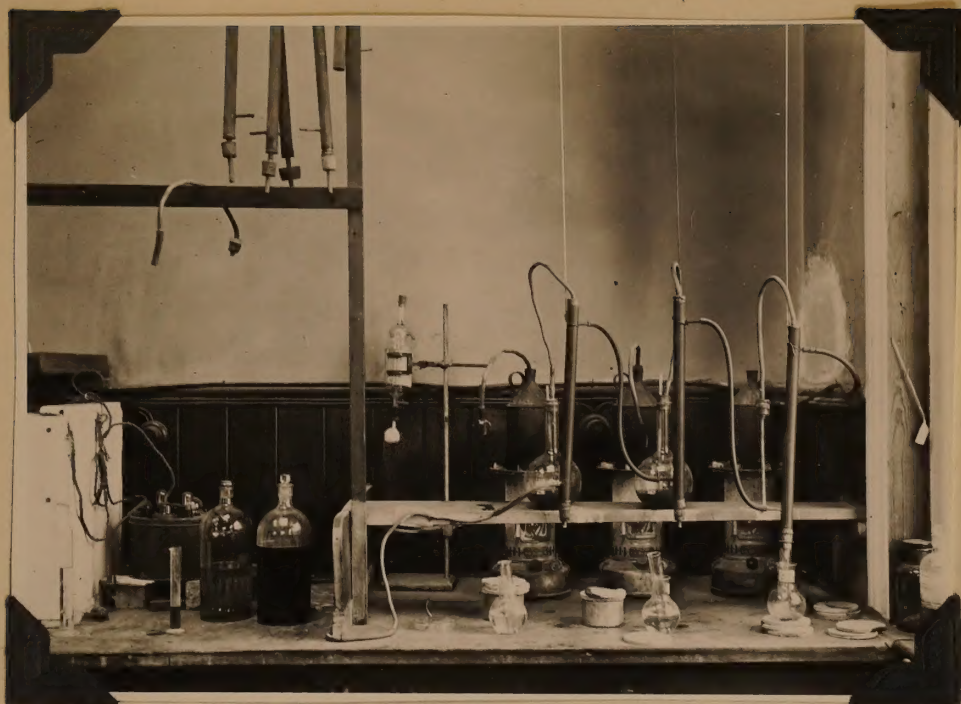
The soil is similar to the Miami except that it has little



K-1472 July 16, 1947
 England. Near Rothamsted. Rendzina from chalk on
 escarpment of Chiltern Hills.



K-1473 July 16, 1947
 England. Woburn laboratory near Rothamsted.



K-1474 July 16, 1947
England. Inside view of old laboratory at Woburn
showing Kjeldahl nitrogen apparatus.



K-1475 July 16, 1947
England. Inside view of old laboratory at Woburn
showing coal-burning still in far corner.

or none of the characteristic B₂ of the Miami.

We return to the headquarters at Rothamsted and I have more discussion with Crowther about the relation of great soil groups in the United States to climate. In fact, I am nearly exhausted before we finish this session.

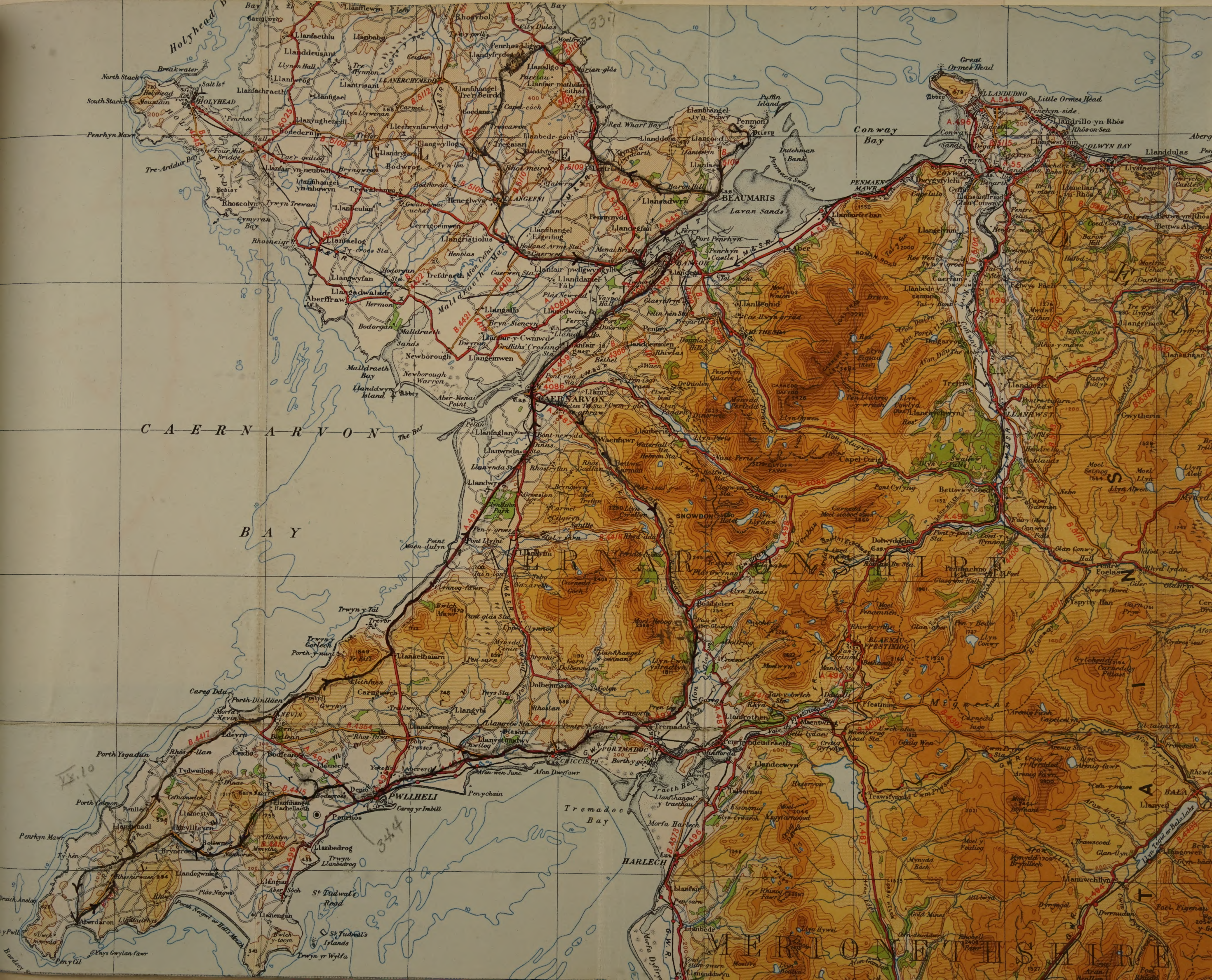
According to Muir and Crowther, many of the Podzols in the United Kingdom have a thin, dark brown ironstone as a B₂ horizon (which they usually call B₁) instead of the thicker ortstein or orterde of the American and Russian Podzols.

I go home with Crowther to dinner, and he shows me many of his African photos and slides.

July 17: Harpenden to Bangor

This morning it rains as I am up early to take the 8:08 train to London. Muir helps me on to the station and I reach London at 9 o'clock. I go immediately to the American Express for reservations to Bangor and for Paris next week. Then I go to the Eustace Station to get the Bangor train which leaves at 10:08. The train is very crowded and I barely get a seat at all.

It rains most all day. The railway goes through the Midlands and skirts Manchester. I change at Crewe about 1:30. The train out is a little late, and I reach Bangor at 5:30 p.m. There I am met by Professor Robinson, where I am to stay during my brief visit. We have a long talk in the evening.



CIRCUIT SIG PERREGAUX

Extrait de la Carte au 1/200.000^e

Légende

Itinéraire suivi : — — — — —

N° des haltes : 7



seen at 1st stop
May 16

July 18: Bangor and Anglesey Island

In the morning I go with Robinson to his laboratory for awhile, and then with him to a wedding in the little cathedral. We stop in for a few moments at the reception and hurry back for an early lunch.

This is a beautiful day for a field trip. We cross the Menai Strait and take the road northeast along the shore north to Penmon. Here I see a thin soil from hard carboniferous limestone. It is on a slight knoll with about 4 to 6 percent slope. At one time the cover may have been forest, but now it is grass and bracken fern. Robinson suggests this soil may be a close relative of the Terra Rossa. I doubt this. Many soils from limestone have a reddish-brown color in the temperate region. I take some very small samples.

A ₁ (p)	0-4"	Reddish-brown granular clay loam (red when dry); many roots. pH 6.1
B ₂	4-12"	Reddish-brown clay with ill-defined nut structure and some vertical cracking. (Red when dry.) Very easily friable, into soft plastic granules. pH 6.3
B ₃	12-15"	Red clay and limestone mixed. pH 7.7
C-D	15" +	Cracked limestone.

We drive back a short distance and then west. We look at the soil near Bodafon Mountain. I look at the soil on a hill where the slope is about 8 or 9 percent. The parent material is largely quartzite; the cover is mainly Erica and



K-1538 July 18, 1947
Wales. On Anglesey Island near Penton. Most of
these fields have glacial till over limestone.



K-11476 July 16, 1947
Wales. Profile of Podzol from quartzite on
Bodafon Mt. (about 400 feet).



K-1477 July 16, 1947
Wales. Profile of Podzol from quartzite on
Bodafon Mt. (about 400 feet).

similar plants along with some grasses. The area has been burned severely in the past. This profile shows definite characteristics of a Podzol.

- | | | |
|-----------------|---------------|---|
| A ₀ | 1-0" | Dark reddish-brown, brittle, very finely matted organic matter. |
| A ₁₀ | 0-2" | Very dark gray humus-rich, loamy fine sand, with many roots and a few fragments of quartzite. |
| A ₁₁ | 2-5" | Dark gray humus-rich loamy fine sand, with many roots and many quartzite fragments. |
| A ₂ | 5-20"(15-30) | Light brownish-gray loamy fine sand that dries to light gray; over one-half the mass is angular rock fragments. |
| B ₂ | 20-30"(25-35) | Very dark brown stony loam, rich in humus; black when wet; some weak cementation to orterde. In places tongues go down deeply but the boundary with B ₃ is very sharp. |
| B ₃ | 30-40"(35-50) | Weathered mass of quartzite stained to an orange yellow. |
| C | 40" (35-50) + | Yellowish-gray mass of quartzite fragments, with gray, pink, and yellow bands. |

In this area are many beautiful rural scenes, with stony walls and hawthorne hedges around the fields and stone cottages for the farm families.

We drive south, and stop for a look at the Arvon soils. These are well drained and developed from till composed largely of mica schist. I look at the soil in a pasture:



K-1539 July 18, 1947
Wales. Anglesey Island. View on Arvon soils on
Brown Podzolic soil (?) on mica schist till.
Excellent pasture.

- A_p 0-8" Dark grayish-brown loam, softly granular; brown when rubbed. (The upper 5 inches now is somewhat more gray in place from just a little drying.)
- B₂ 8-14" Brown, heavy loam, very weak blocky structure. Easily friable to soft crumb; a faint suggestion of reddish-brown mottling.
- B₃ 14-20" Dark yellowish-brown, softly granular loam.
- C 20" + Light yellowish-brown sandy, gravelly, clayey till.

The slope here is about 3 or 4 percent. There are a few small and large pebbles throughout the solum. The roots are thick in the A and numerous in the B.

This is regarded as an excellent soil for the region. It is devoted to hay, pasture, and some small grain.

We return to Bangor. Robinson suggests the possible use of 1-normal sodium citrate at pH 7.0 or slightly higher to distinguish the Podzol from the Brown Forest. He is only experimenting with the method, but suggests using about 5 grams of soil to 100 cc. of solution. He suggests: put on the hot plate for 2 hours; make up for evaporation; allow to stand; pipette; Kjeldahl with 5 cubic centimeters of sulphuric acid; and when completely oxidized, dilute and filter. Iron can be determined by reduction. He thinks this is better than Tamm's reagent. He recommends also Dion's method, recently published in Soil Science. In fact, he has just started to work along this line himself.

In the evening I go with Professor Robinson to a meeting of ecologists during which he addresses them on the Soils of North Wales. Then to a late dinner and to bed.

July 19: Bangor and Aberdaron

This is a rainy morning as we start out on a trip south and southwest of Bangor. I see several profiles with thin solums that were undoubtedly once Podzols, but the A₂ is now massed by organic matter from long periods in grass.

It is very wet to look at soils, especially in the mountains, but I try several photographs, which will likely be foggy. I look hurriedly at one of these rehumified Podzols with a cover of low thyme and grasses:

A ₀ and A ₁	1 1/2-0"	Brown loose loamy sand, and dense mat of dwarf heather roots.
A ₂	0-7"	Grayish-brown loamy sand.
B ₁	7-11"	Brown loamy gravelly sand.
B ₂	11-20" (15-30)	Brown to reddish-brown loamy gravelly sand, with some evidence of ortstein.
C	20" (15-30) †	Water sorted gravelly sand.

We stop at a little wayside inn for lunch. It is very cold and wet, and the fire in the grate seems good to me.

After lunch we continue to drive southwest near the area of "whistling" sands. There are a good many pasture fields with grass and dwarf heathers that have been



K-1479 July 19, 1947
Wales. Looking across Cruellyn Lake to stone
drift fence on sheep pasture.



K-1480 July 19, 1947
Wales. At Aber Glaslyn.



K-1481 July 19, 1947
Wales. Old bridge.



K-1482 July 19, 1947
Wales. Old inn.

developed by burning the peat from a Half-Bog soil. I look at one of these, where perhaps 10 inches have been burned away:

- | | | |
|----------------|-------|--|
| A ₁ | 0-2½" | Very dark brown to black mucky silty loam. |
| G ₁ | 2½-6" | Dark gray heavy loam, mottled with brown and medium gray. |
| G ₂ | 6-20" | Mottled gray, yellowish-brown, yellow, and reddish-brown fine sandy clay loam. Coarse blocky and irregular prismatic structure. Grades into: |
| C | 20" + | Less mottled gray heavy loam, with calcium carbonate at about 30 inches. |

This is a rather bleak landscape, especially on a wet, cloudy day. It reminds me a great deal of the Aleutian Islands, except that here the land is farmed, and there are many stone walls and hedges, and gray stone farm houses.

We drive down for a glimpse of Aberdaron, a small village near the end of the point. Nearly everyone in this region speaks exclusively Welsh. This whole area is considerably isolated. On the way back between Aberdaron and Nevin I see rehumified Podzols developed from Sarn granite near Mynydd Cefn Acefnamwich Hill. They now have a cover of bracken, heather, thyme, and grass. Near here, Robinson shows me some brown soils developed from thin drift over shale that he suggests may be similar to our Dutchess. North of Nevin I look at a brown soil from colluvium that is called the Madryn series in the Welsh survey.



K-1483 July 19, 1947
Wales. View near whistling sands.
Pasture with some heather in foreground.



K-1484 July 19, 1947
Wales. Looking at Aberdaron from
seashore.



K-1485 July 19, 1947
Wales. Looking at Aberdaron from road.



K-1486 July 19, 1947
Wales. Looking at Aberdaron from road



K-1487 July 19, 1947
Wales. Penelech Church and farm.



K-1488 July 19, 1947
Wales. $\frac{1}{4}$ mile north of Nevin. Brown soil on
colluvium. Madryn series.



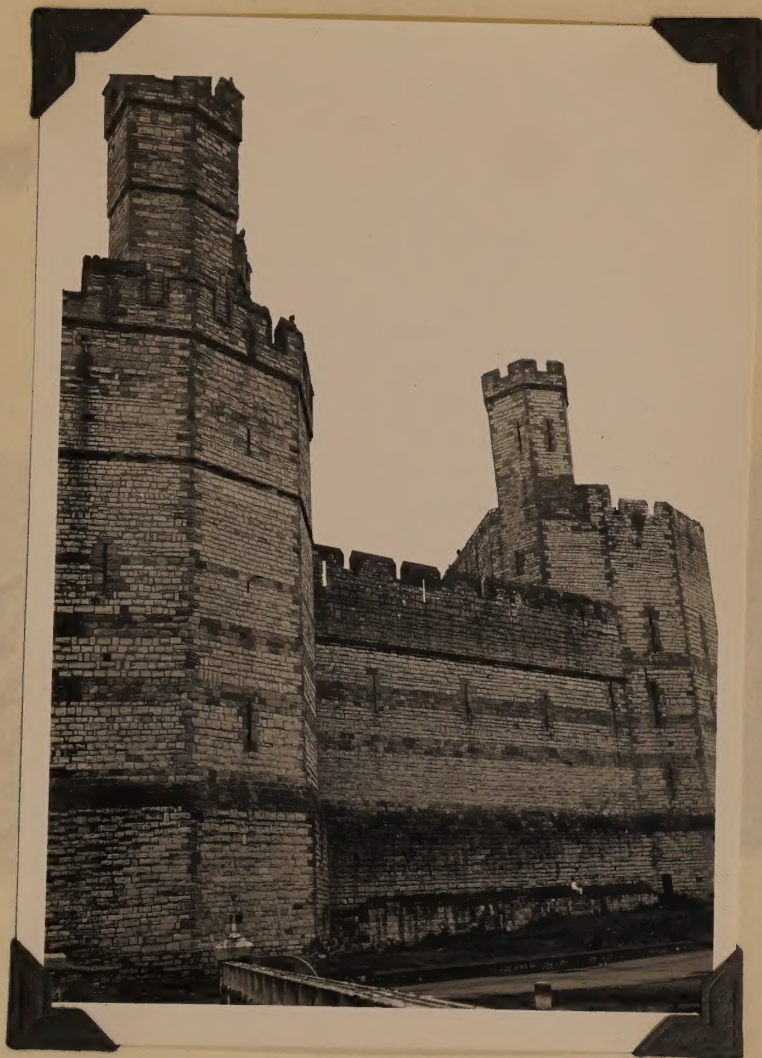
K-1540 July 19, 1947
Wales. Between Aberdaron and Nevin. Profile
of rehumified Podzol. With Professor Robinson.



K-1541 July 19, 1947
Wales. One-half mile north of Nevin. Brown
soil of the Madryn series on colluvium.



K-1542 July 19, 1947
Wales. About 3 miles north of Nevin. Typical
rural landscape.



K-1489 July 16, 1947
Wales. Caernomon Castle built by Edward I
to keep Welch in subjection.



K-11490 July 17, 1947
Wales. View of Bangor. University just
right of center.

Some 2 or 3 miles further north I look at a soil in the hills from andesite with a black humic layer, some 3 or 4 inches thick (A_1) over a brown B horizon that extends to 15 inches. This is underlain by yellowish or grayish silty very fine sandy loam thought by Professor Robinson to be very high in aluminum.

About 2 miles south of Bangor we look briefly at an acid brown soil developed from acid volcanics, probably very old rhyolite. We should likely call the soil Brown Podzolic in the United States. It is the only place today I have seen anything like deep weathering. In one place in a road cut there is deep, highly mottled rotten rock to a depth of 7 or 8 feet that almost suggests the tropics.

We are back in Bangor at 6:30 after a cold, wet day.

Tonight we have dinner at the Castle Hotel, the main hotel in Bangor. Then we go to a seminar of ecologists who are meeting in Bangor now, to hear papers on historical ecology.

I notice today that there are a great many rabbits living in holes in the old hedge rows. One of the speakers suggests that the introduction of rabbits into Wales had a catastrophic effect on the vegetation. He says that in many instances the rabbits eat more than the farm animals. A speaker also points out the great effect on the vegetation

in the hills by reason of the changes from cattle to sheep, and later the change from the marketing of 5 year old wethers to spring-born lambs in the fall.

On the whole, this meeting is a frost. I am very tired. For $2\frac{1}{2}$ hours I sit in the most uncomfortable seat I have ever sat in before. Finally to bed.

July 20: Bangor

In the morning I go with Professor Robinson to the church service in the cathedral. Afterward I check up a bit on my notes and we take a long walk through the city, out over the foot hills, and through the golf course of the Country Club. In the evening two young men drop in for a chat: one is a graduate student from Spain, Senor J. R. Abad, of the Estación Biología Experimental et Zaragoza in Spain. The other is a young botanist and soil scientist, Mr. A. C.S. Wright, of the Soil Bureau, 54 Molesworth St., Wellington, New Zealand. Mr. Wright shows us some exceedingly interesting pictures of very highly developed Podzol-like soils formed locally under the kauri gum tree (Agathis australes) — a conifer in New Zealand. This conifer sheds its leaves and its bark to build up a thick layer of duff, up to 2 or 3 feet thick near the trunk of the tree and tapering to almost nothing at the tips of the branches. Thus under the tree the horizons of a Podzol are developed in a sacuer-like layering.

1) See Down-Under Journal (1949) for details.

The A_2 may be up to 6 feet thick! And is also cemented hard like rock. Adjacent to this, under other types of forest, the soil may be a normal Brown Forest. At the most one may have 2 stands of these trees in the same place and then the soil is unproductive for any kind of forest, including the gum tree itself, or for any kind of crops. He says if one goes north toward the equator the contrast between the soil under the gum tree and the adjacent soil diminishes. He is not sure that the contrast even exists at low elevations on the equator.

He gives me one slide made from a photograph of the road cut under such a tree. Certainly this is a very interesting soil. So I shall have at least one more trip to take.



View of profile developed under old Kauri gum tree in New Zealand.
(From slide given me by A. C.S. Wright.)

July 21: Bangor to London

I am up early for the train leaving Bangor at 7:13. Again it rains. I change at Llandudno. Then beyond Crewe our train is delayed because of a wreck ahead on the main line. We wander across country on branch lines to get around the wreck. We reach London at 3:15, 2 hours late. The confusion at the depot is simply terrific. I finally get a cab to the American Express. Here I find there are no airplane seats available for weeks. But I get a reservation for the boat train to Paris leaving tomorrow morning -- the long route by New Haven and Dieppe. I also get a few more francs at the American Express at a robber's rate. I send a telegram to Thibodeaux so someone will know where I am, and go to the little room reserved for me at 15 Clarges Street. It is now 5 o'clock and I have had no lunch, so I walk to a little place nearby for tea. My opinion of the American Express at the present moment could not possibly be described properly in these notes.

I look around awhile in the book stores, and then walk down to Piccadilly Circus. Along the main street I do not see a great deal of damage; then I walk a block or so away from the main street and see an enormous amount of damage from the blitz. Many large buildings were badly smashed, and a lot remains to be done to clear away the rubble and rebuild them.

I stop at a small restaurant for my dinner and read the evening paper. I am glad I was not on the early train to Bangor today. That was the one wrecked that held up my train to London. Several were killed and many injured.

My little room is small but comfortable, except for a large volume of dance music that floats in from a restaurant across the court. I am now getting anxious to be home. It is a mean job to straighten out my back tonight.

July 22: London to Paris

I am up for a good breakfast at 8:30, and then for the boat train leaving Victoria Station. The train pulls out at 9:35 a.m. for New Haven. I take a few pictures from the train and reach New Haven a little before noon and transfer to the boat. The boat leaves promptly and we arrive in Dieppe about 3 o'clock in the afternoon. In making the transfer to the train there is a terrible press on the boat and at the customs. It seems as if the French somehow could avoid these extraordinary inconveniences. The train is quite crowded.

We leave Dieppe a little late, but arrive at the St. Lazarre Station in Paris at 7:15. Another terrible crowd and confusion. There are no taxis at all at the station. I finally get onto a bus which is accommodating a special tour and go to the Ambassador Hotel. Here I get a taxi and



K-11491 July 22, 1947
England. Near Chatwock, south of London.



K-11492 July 22, 1947
England. Near Haywards Heath.



K-1493 July 22, 1947
England. South of Haywards Heath.



K-1494 July 22, 1947
England. North of New Haven.



K-1495 July 22, 1947
England. North of New Haven.



K-1496 July 22, 1947
England. New Haven.



K-1497 July 22, 1947
England. New Haven.



K-1498 July 22, 1947
England. On boat, New Haven to Dieppe.



K-1499 July 22, 1947
France. Dieppe from train.



K-1500 July 22, 1947
France. South of Dieppe.

go to the office of T.W.A., as I had been instructed to do, but the office is closed! Finally a janitor lets me in and I call the exchange, and am told to wait. In a few minutes a young man and woman come in to check my tickets, and then tell me to go to the air station -- the Gare^{des} Invalides. So here goes another expensive taxi ride.

I am told at the air station to be back by 12:30. Since it is already about 9 o'clock and I have had no dinner, I cancel my hotel reservation and go out for dinner. I have a very simple dinner, partly because my digestion is all upset again, and partly because I am now short of francs.

I am back at the station to wait at 10:30. After considerable time, the lady attendant tells me that I don't need to be there until 3:30! This is a fine time to tell me that. Thus I could have had a fair night's sleep, but as it is I must sit up all night in this big, deserted station.

Thus does one day end and another begin.

July 23: Paris to New York

I am checked in at the desk at 12:10 a.m. and then I wait, and wait, and wait. Two or three other passengers have also been misinformed, but most come in about 3:30. We leave the station at 4:30 in a bus for the airport. Here we have some waiting in line. We must get landing cards stamped by (1) the police, (2) the health officer, (3) the exchange control official, and (4) the custom inspector. I am already very tired waiting, but here comes some more. This plane was scheduled to leave at 1:00 a.m., and now we shall do well to leave at 6:00 a.m. There is no way to tell when we shall be in New York.

We are in the air at 6:07. I get a good view of the Normandy beach and a glimpse of southern England, but for the most part we ride above the clouds.

As we start down to land at Shannon the country is very green and pretty under the low ceiling. The farmers are cutting hay here as in England. Near Paris the oat and wheat harvest is just starting, but it will be a long time yet in Shannon. We are down at Shannon at 8:45 a.m. I have a most excellent breakfast. Then there is another delay because of some engine trouble with the plane. Finally we go out into the plane and taxi to the end of the runway but the pilot brings it back for some more inspection. Finally we get

away from Shannon at 12:08 p.m.

We ride over clouds most of the time. I read some and make out my customs declaration. I am terribly tired and yet cannot sleep. I never was so nervously anxious for a voyage to be over. Right now, I decide never to take another long flight again. But probably I shall change. Certainly I shall never again try to go from London to Paris to New York continuously.

We are down at Gander, Newfoundland at 9:20 Paris time, or 4:20 eastern daylight time. It is very hot in Gander -- unusually so.

We are in the air again at 5:20 for another long, tedious grind to New York. We are down in New York at 10:30 eastern daylight time. I have quite a bit of wait until the baggage is brought in, but everything is orderly. My customs declaration and so on are all in order, and I am very soon out. In fact, the first one.

Fortunately Mrs. Kellogg is here to meet me with reservations immediately for Washington. We are in the air out of New York at 11:52 and arrive in Washington at 1:15 eastern daylight time. Finally home in my own bed at 2 o'clock.

CONFERENCE INTERNATIONALE DE PEDOLOGIE MEDITERRANEENNE
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(Géographie régionale - Climatologie - Géologie - Pédologie
Phytogéographie)
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1/ GEOGRAPHIE REGIONALE -

ALLIX (A.)

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